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Nov. - June

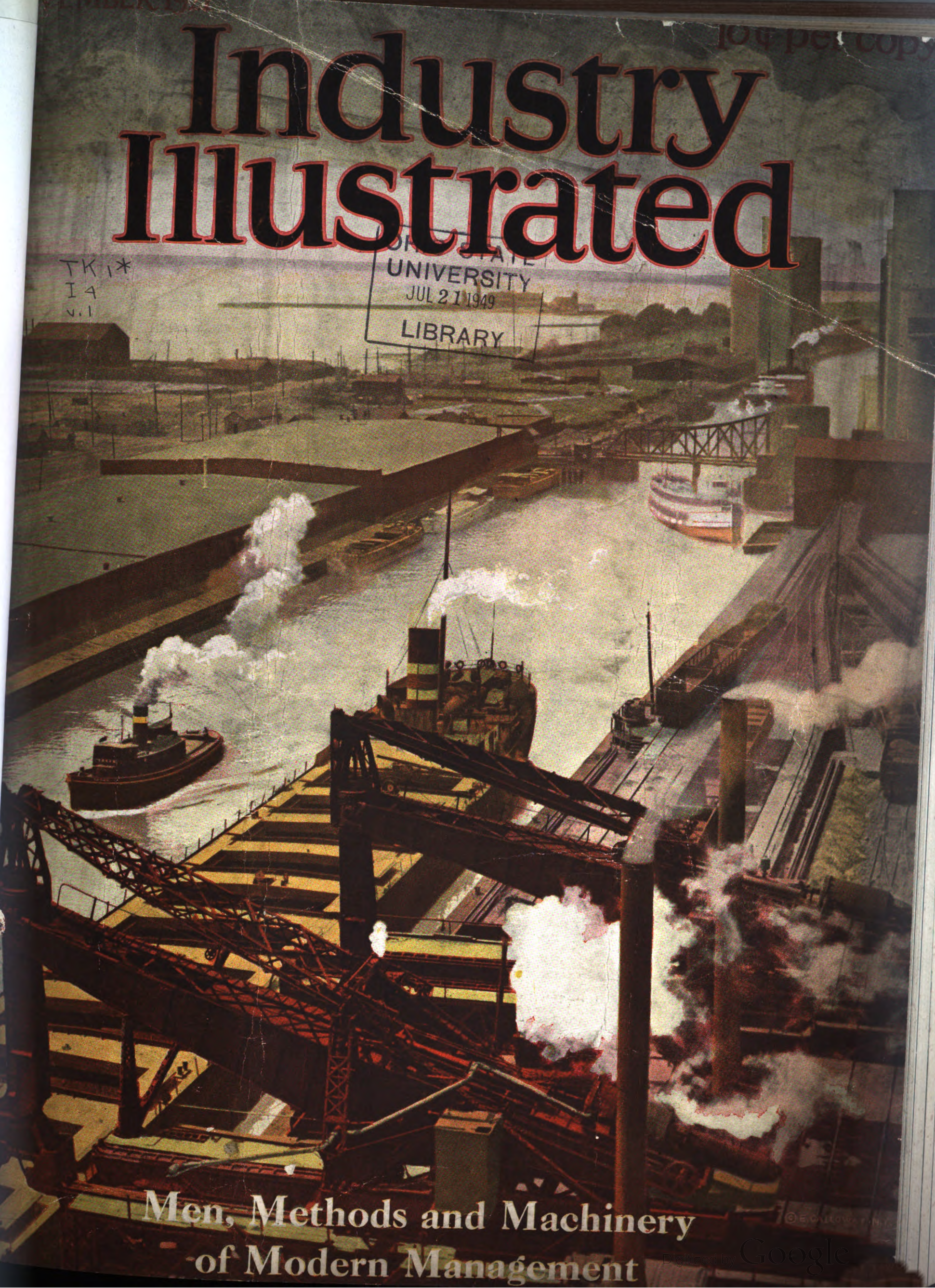
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Men, Methods and Machinery of Modern Management

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Lift Trucks Are Real Aids To Economical Production

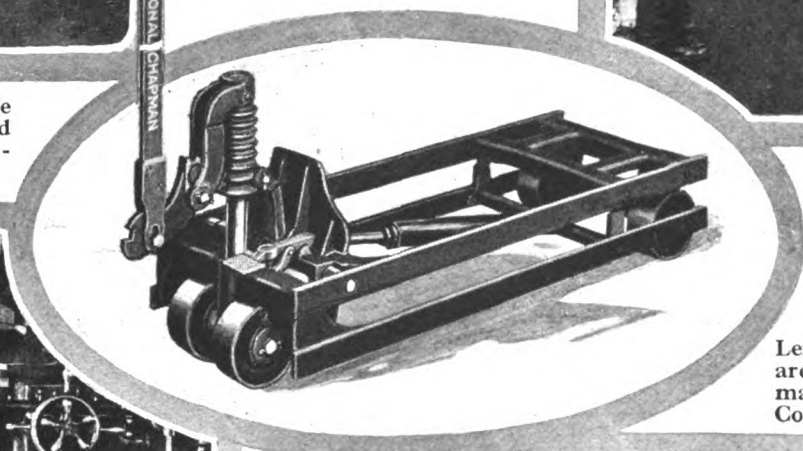
The modern method of keeping costs down is to keep your product—not on wheels as formerly—but on platforms. Then to quickly run the wheels of a lift truck under the platforms whenever they must be moved. The fact that all lift trucks are equipped with Hyatt roller bearings enables one man to handle quickly and easily loads up to 6,000 lbs.



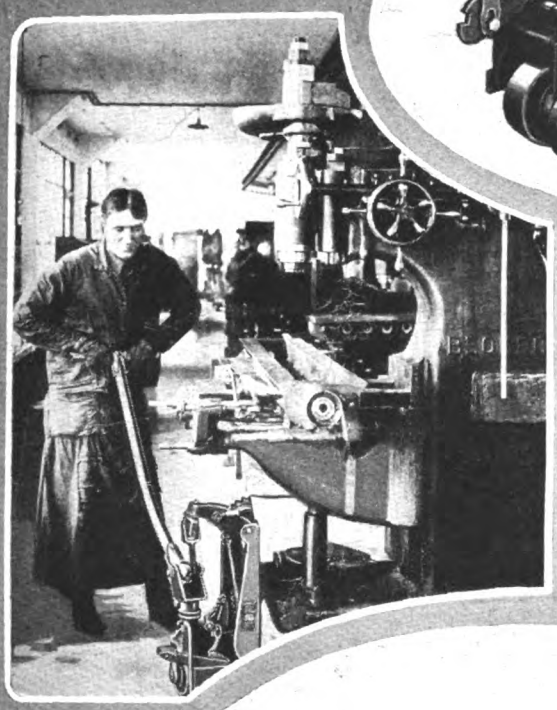
Above–Transferring heavy automobile engine castings on Hyatt equipped Multi Trucks made by Barrett-Cravens Company, Chicago, Ill.



Above—The Hyatt equipped Transveyor manufactured by the Cowan Truck Company, Holyoke, Mass., handling heavy castings.



Left—Easy running Hyatt roller bearings are a standard part of all National-Chapman trucks built by the National Scale Company, Chicopee Falls, Mass

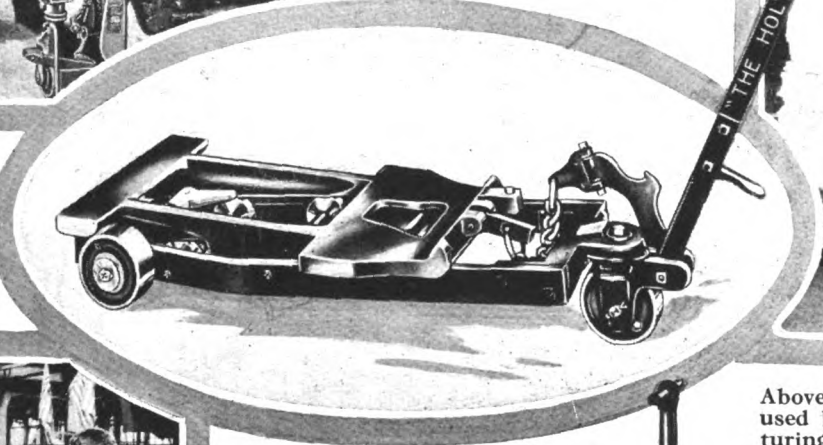


Above—Moving heavy drill press in process of manufacture on a Hyatt equipped truck manufactured by the Lewis-Shepard Company, Boston, Mass.

Lift trucks with their convenient narrow gauge, their small wheels and their heavy loads require a bearing capable of taking concentrated loads on a limited area. Hyatt bearings with their sturdy steel rollers meet these conditions 100%—that's why 100% of all lift trucks are Hyatt equipped.



Above—Sturdy Hyatt bearings are used by the Sturdi-Truck Manufacturing Co., Holyoke, Mass. These trucks handle loads like this with ease

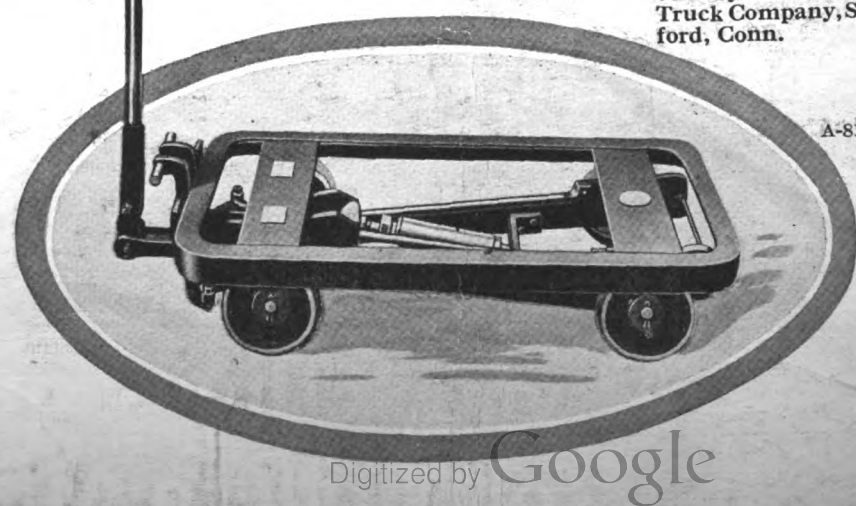


Above—This Hyatt equipped truck is the product of the Holyoke Truck Company, Holyoke, Mass.



Left—At the National Screw & Tack Company, Hyatt equipped trucks built by Stuebing Truck Company, Cincinnati, Ohio, speed up production.

Below—Here's the Hyatt bearing truck put out by the Plimpton Truck Company, Stamford, Conn.



A-814

Hyatt Roller Bearing Company,
New York, N. Y.

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Industry Illustrated

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(On Page 58 will be found a list of those who assisted us by supplying some of the photographs for this issue.)

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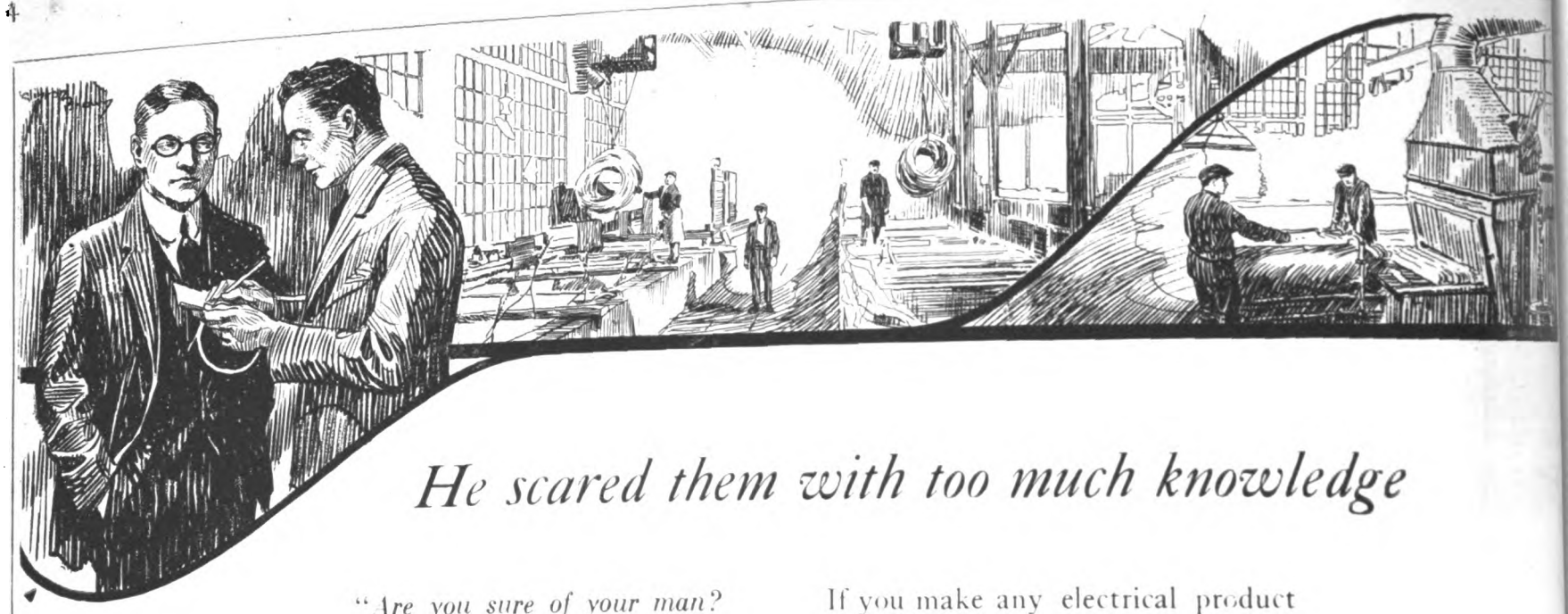
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He scared them with too much knowledge

"Are you sure of your man? Has he been with you long? Are you certain he is in no way connected with any competitor of ours and will not pass along any information concerning our product and processes?"

SO wrote a new client after the first visit of one of our Account Executives. To him it seemed impossible that one untrained in his business could ask such searching questions, ones that penetrated straight through to vital points; could so quickly grasp the technicalities of machines and methods, of processes and product.

It's needless to say that this client's fears were groundless. Like all of our Account Executives, this one was a Director of our Company and was financially interested in it. He had merely followed the custom of our men and had learned from *outside* sources much about this new client's goods, as well as those of his competitors, before making his *inside* investigation.

Our Account Executives are trained for the investigation of technical advertising and merchandizing problems, and are skilled in the writing of advertising that *produces results*.

If you make any electrical product you will find a man within our organization who can talk to you in your own language. Should it be power plant equipment, or material handling machinery, or almost any other mechanical appliances you will find at least one member of our organization who can meet you "upon your own ground." Whether your advertising and selling involves "merchandizing" or "direct to user" problems you will find here men whose experience will aid in solving them.

This is a business organization of "business men" engaged in rendering effective and complete advertising service to manufacturers of machinery and mechanical and electrical appliances and products. It differs materially from a "General Agency."

We would like to have you meet us and visit us. We will gladly show and explain to you every detail of our work, and introduce you to each man in our organization.

RICKARD
& COMPANY, INC.
PRODUCTIVE PUBLICITY
25 SPRUCE STREET, NEW YORK CITY

During the year 1920 we placed over 3500 pages of advertising in Business Papers alone for clients using "Rickard Service."

This volume will be exceeded in 1921.

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INDUSTRY ILLUSTRATED

John H. Van Deventer, Editor

W. Thomson Lees, Associate

Reginald Gordon, Associate

Editorial

A Creed for the Steady Climbers

There are no level paths to success in industrial life. One must keep climbing, or slide back.

Keep Climbing!

One thing above all others you must have if you would conquer mountain peaks.

Faith!

No mountain climber may expect to gain the heights without faith—faith in himself, faith in his fellows, and faith in the worthwhileness of the effort.

It is not how high you climb that counts—it is how long you keep climbing. Cultivate faith—belief. While you have faith you will keep climbing.

Faith—belief—performs miracles. It transforms weaklings into giants, cowards into heroes, steel mill laborers into Schwabs.

No man can attain success in industry or business without believing in himself, believing in his fellows, and most of all, believing in the worthwhileness of his job.

Faith necessitates a Creed. Here is a creed for the industrial "Up and Coming." It will help you to keep climbing.

¶ I believe in myself and in my job. I will swing this job better than any other man could swing it.

¶ I believe in my fellow workers. I pledge to them a square deal and a helping hand.

¶ I believe in my Firm and its Product. Their good name is my good name.

¶ I believe in the immortality of work well done; that—

"Each hammer blow, each problem solved, each task performed with care
Becomes at once immortal—adds a step upon the stair
On which the future ages must climb toward the sun,
Just as this generation builds on what the past has done."

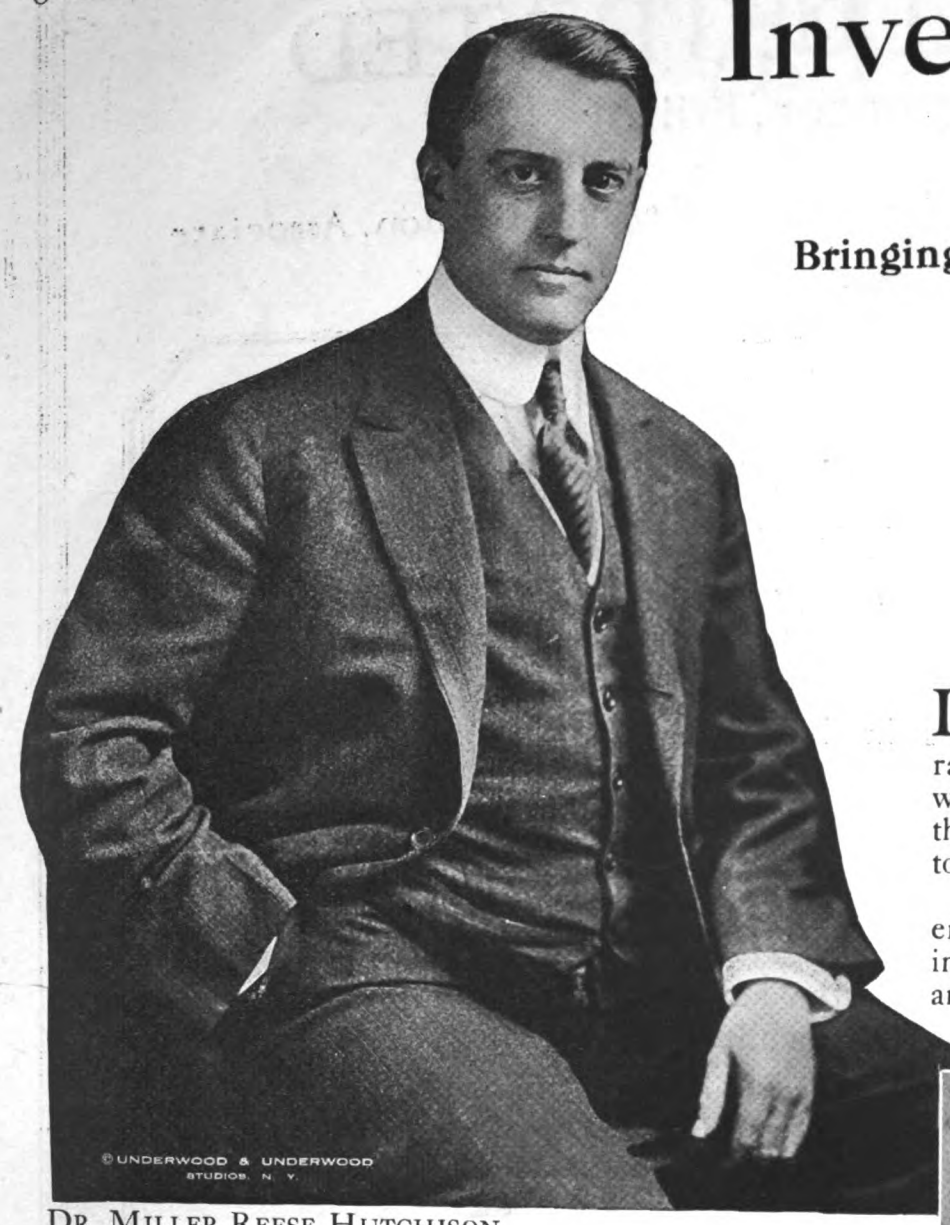
I Believe in My Job!

Additional copies of this Editorial will be furnished on request

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Inventors Who Have

Personal Interviews with Four



DR. MILLER REESE HUTCHISON

Bringing Inventive Genius and Capital Together

An Interview with Dr. Miller Reese Hutchison

Dr. Hutchison made up his mind when a boy to two things: First, that he would some day be chief engineer of the Thomas A. Edison Laboratories, and second that he would do the things that we tell about in this interview. In pursuance of the first he became associated with Thomas A. Edison in 1910 for special work on storage batteries, and in 1912 reached the goal of chief engineer of the Edison Laboratory and all affiliated Edison interests, and in 1918 became the engineering advisor for Thomas A. Edison. Today Doctor Hutchison is president of Miller Reese Hutchison, Inc., an organization devoted to bringing worth while inventors and business men together.

INVENTORS have been sometimes looked upon as rather scatter-brained people who spend most of their time thinking up impractical ways to do unnecessary things.

Of course this is an entirely erroneous view to take because in invention lies our quickest and surest road to world-wide economic recovery and individual wealth.

Why put so much emphasis, for example, upon improving the efficiency of our present day factory processes from 25 to 30 per cent by cultivating the maximum in management and operation and overlook

(*Continued on Page 36*)

Which Comes First—Price or Production?

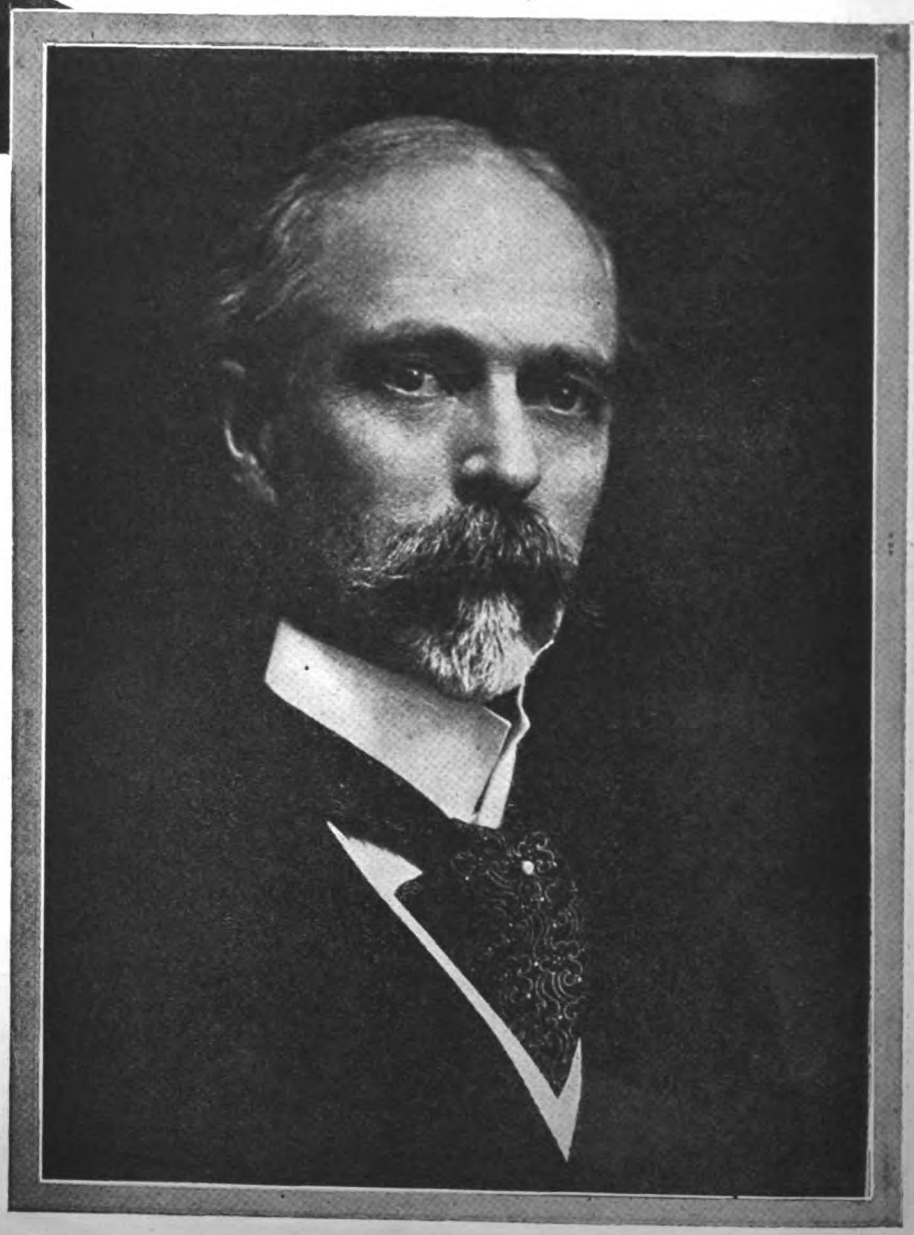
An Interview with Robert H. Ingersoll

Robert H. Ingersoll is a pioneer in that modern school of merchandising and manufacturing which believes in an enormous production made possible through a minimum selling price. Mr. Ingersoll commenced the manufacture of the "dollar watch" in 1892, and has since sold close to one hundred million of them. It is quite likely that Mr. Ingersoll was a direct means of inspiring Henry Ford to the quantity production low-cost idea. For it is a known fact that before Ford started in the automobile business and after Mr. Ingersoll had produced the dollar watch, Henry Ford contemplated the manufacture of low priced watches. Mr. Ingersoll tells the readers of "Industry Illustrated" how he established his huge production low-cost cycle.

THERE is one man to whom Mr. Einstein's revolutionary theories about the measurement of time make very little practical difference, and yet this same man has provided more means of measuring time than any other man in the world. The gentleman alluded to is Mr. Robert H. Ingersoll who demonstrated the sound business economics involved in quantity-production at low cost combined with the marketing strength of a low selling price.

A visit to the plants where Ingersoll watches are made reveals very clearly the secret of producing such a complicated machine as a watch at a remarkably low price. Enormous production is the answer. Rows upon rows of highly developed special machines of superhuman ingenuity reduce labor and attendance to a minimum, turn, mill, drill and stamp raw materials into complicated finished parts. Even the assembling, winding, test-

(*Continued on Page 39*)



ROBERT H. INGERSOLL

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Made Invention Pay

Successful Originators

Does Labor Benefit Through Invention?

An Interview with Frank M. Leavitt, E. D.

Frank M. Leavitt is an inventor who gets his inspirations in a flash and then puts in weeks and months of hard work perfecting them. He is perhaps best known as the inventor of the Bliss-Leavitt torpedo used by the United States Navy and in which his idea of heating the compressed air motive fluid, plus many months of designing, experimenting and perfecting, gave this weapon a range of 15,000 yards as compared with the 800 yards range of the old Whitehead.

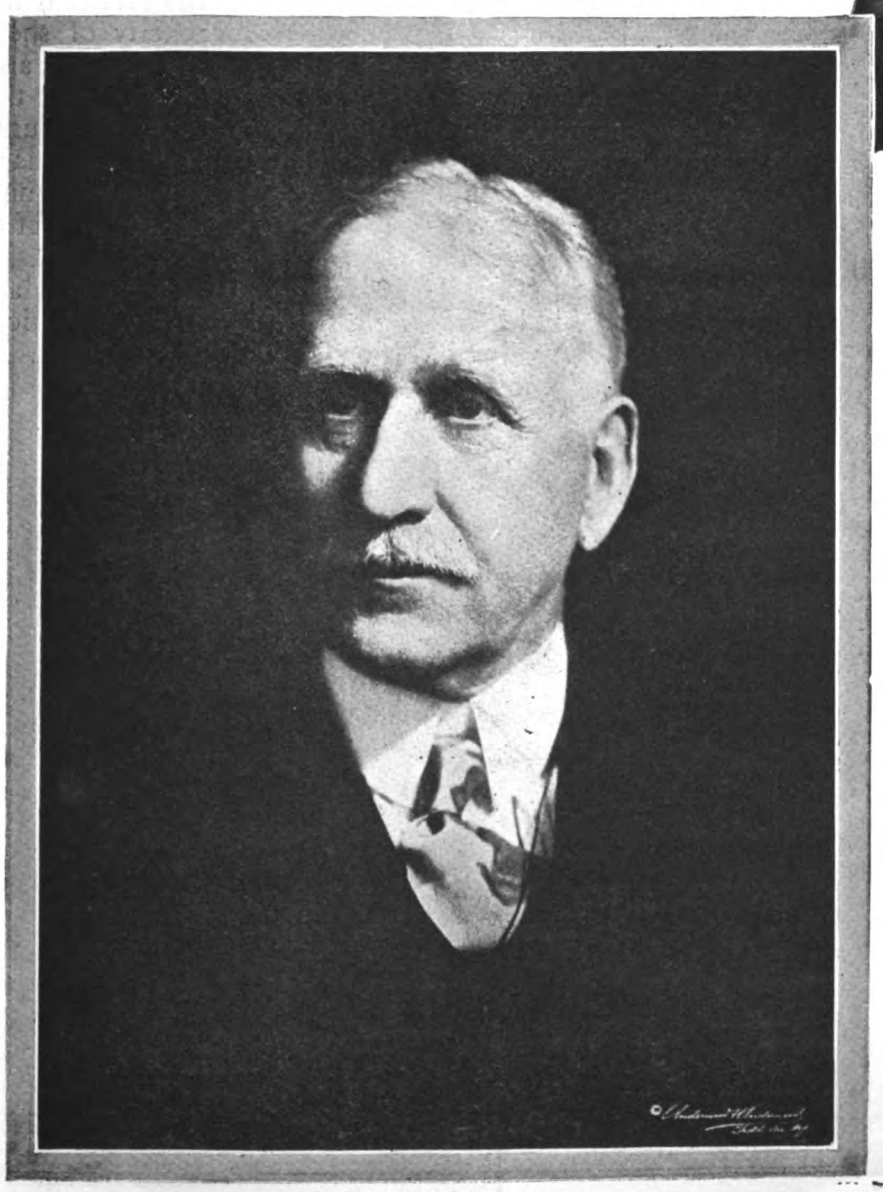
A LARGE majority of our important inventions are classed as "labor-saving." An invention that really saves labor—that reduces the cost of making a necessity or a semi-luxury is sure of a hearty welcome from some enterprising manufacturer. But it is not always sure of a hearty welcome from labor, and this is not altogether to be wondered at.

For the first effect of a new labor-saving machine is usually to deprive a number of people of work or at least to make them seek new employment. That is its *first* effect and to labor, its most obvious one—the effect that led to the bloody "riots of the weavers" in England in 1779, after the spinning machine had been invented by Sir

(Continued on Page 42)



DR. FRANK M. LEAVITT



SPENCER MILLER

Will Standardization Help or Hurt Inventions?

An Interview with Spencer Miller

Spencer Miller "knows the ropes" in a technical way probably better than any other man in the world. His overhead cableways have revolutionized a number of industries. His invention for coaling warships at sea is the only invention anywhere in the world that has performed this function successfully and which fills a need that had existed in every Navy for ten or twenty years and that had invited many unsuccessful attempts at solution. Read what Mr. Miller has to say about the obstacles facing our future inventors.

NOWADAYS one of the great movements in industry is toward standardization. A decade ago this was confined to the simplest mechanical elements such as the pitch and dimensions of machine screws, the dimensions and spacing of rivets, and the like. Standardization, however, makes things cheaper to produce and anything that will do this is looked upon with great favor by those whose business is production. Naturally the idea has had a tremendous growth, and today we have a strong tendency toward the standardization of complete units or combinations of machine parts and even of completed machines. Railway car couplers serve as a good illustration of this. Their design is as fixed and unalterable as the laws of the Medes and the Persians. What a thankless task it would be for an inventor to produce and try to market today a radically different and radically better railway car-coupling mechanism. Before getting

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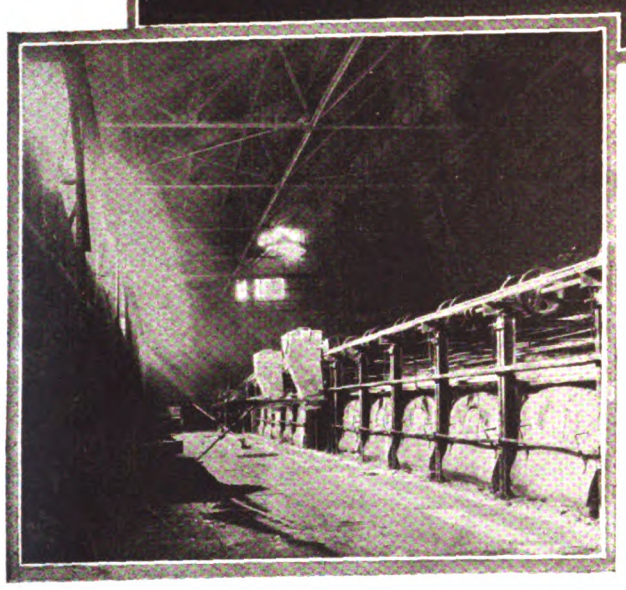
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The Story of a Pane of Glass

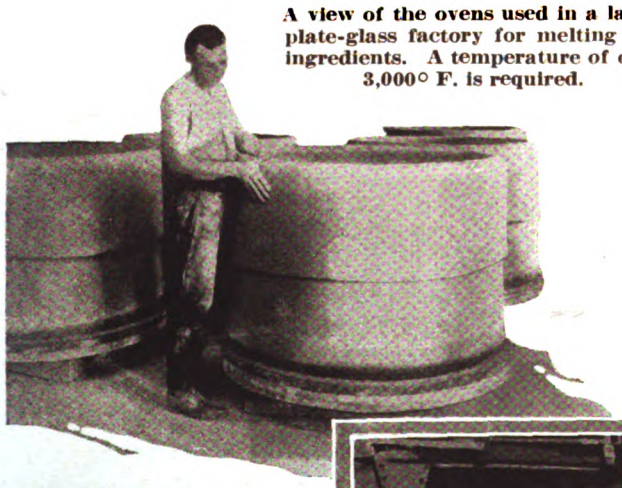
Ingenious Machinery Transforms a Sand Pile into Show Windows



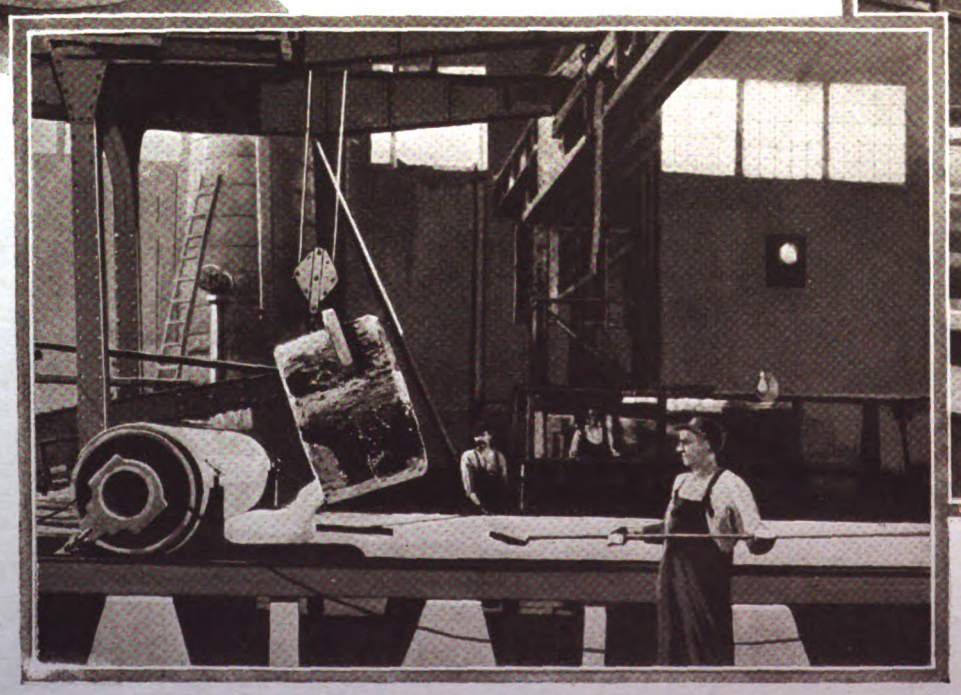
Mixing the ingredients—chiefly, white sand, soda-ash and limestone—from which glass is made.



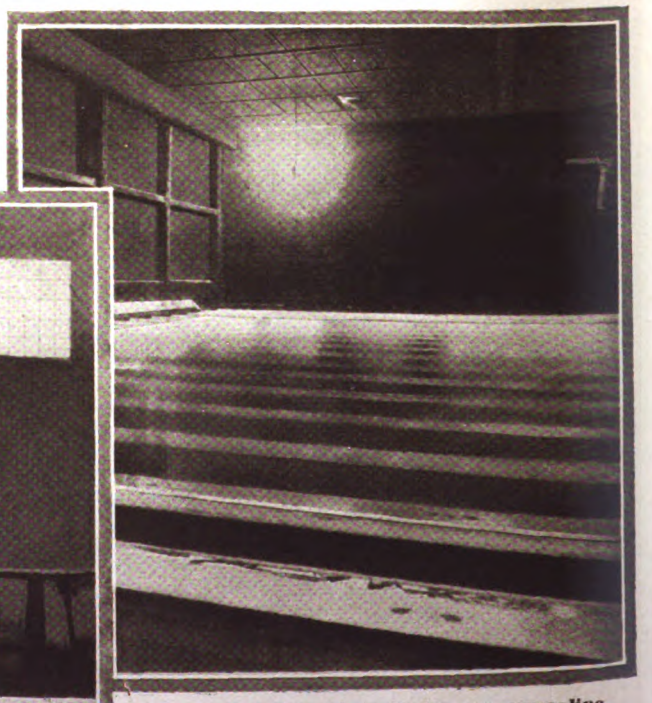
A view of the ovens used in a large plate-glass factory for melting the ingredients. A temperature of over 3,000° F. is required.



At the left—Making the clay pots, in which glass is melted, is one of the most tedious and expensive operations connected with glass manufacture.



Pouring molten glass on the casting-table, where the roller will flatten it out—the first step in making Plate Glass.



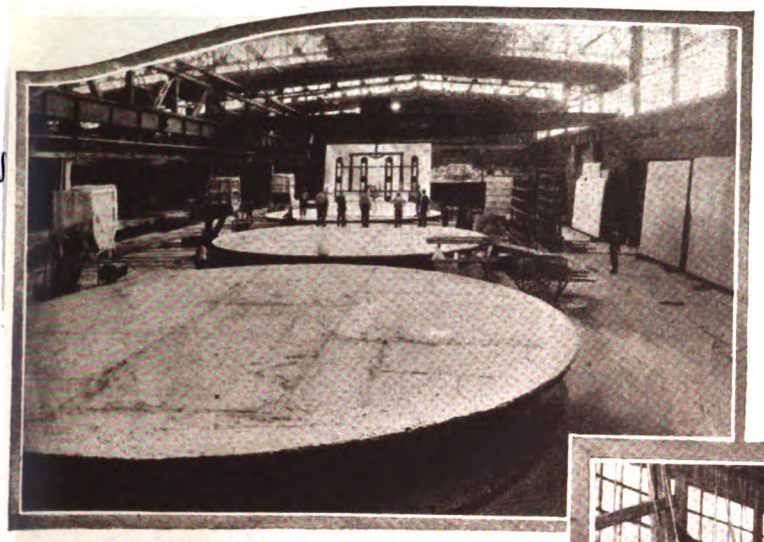
Interior of a Lehr, or annealing oven. After being cast and rolled, the plate must be slowly cooled in the Lehr, to prevent extreme brittleness.

JUST as bath tubs were once legislated against and heavily taxed, so windows in Europe, in olden times, were classed as a luxury; each square inch of window being required to pay a heavy tax to the state. Even now there are many buildings in Europe which were built under those conditions, where windows are chiefly conspicuous by their absence.

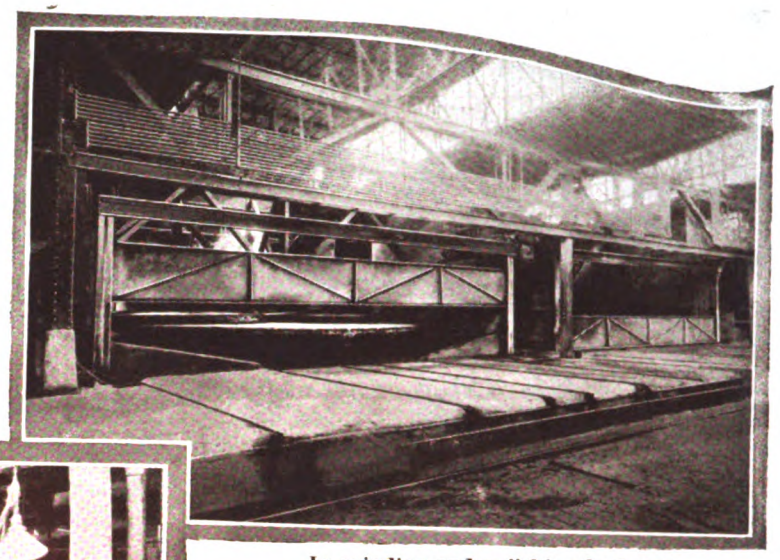
The modern "daylight factory," in which the window space far exceeds the wall space, became a possibility only when mankind learned to appreciate the value of sunlight. But to transform the possible into the actual required more than mere appreciation; it required the production of sheet glass on a scale undreamed of a few decades ago. That this latter requirement has been met is indicated by the fact that the productive capacity of sheet glass (both window glass and plate glass) factories in the United States today amounts to about 650,000,000 square feet per year. Of this amount, roughly two-thirds is what is known as "window glass," while the balance is plate glass—the latter classification including wire glass.

Plate glass, as distinct from

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After annealing, which takes from an hour to several hours, according to thickness, the glass is mounted on circular grinding tables.



In grinding and polishing both surfaces, the thickness of the original sheet is reduced by about one-half.



Below—"Bevelled Plate Glass" requires five separate operations to produce the bevel edge; and carelessness at any stage means a shattered glass.



Above—Plate glass must be highly polished and cleansed before silvering, in the making of plate-glass mirrors; else defects are bound to develop in a short time.

Below—Applying silver solution, to make high plate glass mirrors. The wedges scattered about are for use in levelling the glass.





Polishing a bevelled sheet of glass—apparently—is similar to buffing a metal plate. But metal plates haven't the same tendency to resent undue pressure.

ordinary window glass, though made from essentially the same ingredients, is made in an entirely different way. The "batch," composed of white sand, soda-ash, lime and a small proportion of decolorizing agent, is placed in clay pots and melted at a temperature above 3,000° Farenheit. These pots, incidentally, are not the least expensive part of glass making. They require a special kind of clay, are difficult to make, must be "seasoned" for from three months to a year, and their useful life is extremely short.

The pot with its molten glass contents is carried by overhead crane to the casting table—a large, flat iron table with a heavy iron roller which is arranged to roll over its length at any desired height determining the thickness of the glass sheet. As the molten glass is poured on the table, the roller kneads it out into an even, flat sheet; both surfaces of the sheet, however, being rough.

If the cast sheet were allowed to cool too quickly, or unevenly, it would be so brittle as to be useless. It is therefore passed into the lehr, or annealing oven, cooling gradually and uniformly before undergoing polishing.

After the rough edges have been trimmed off, a number of these annealed sheets are placed on the grinding table (being handled by a crane by means of ingenious suction cups), where they are firmly tramped down into a bed of plaster. As these tables revolve, the upper surface of the glass sheets is first rough-ground by means of revolving runners which reach every part of the surface—sharp sand and water being the grinding medium, followed by emery for a finer grinding. The reverse side of the glass is then put through the same process.

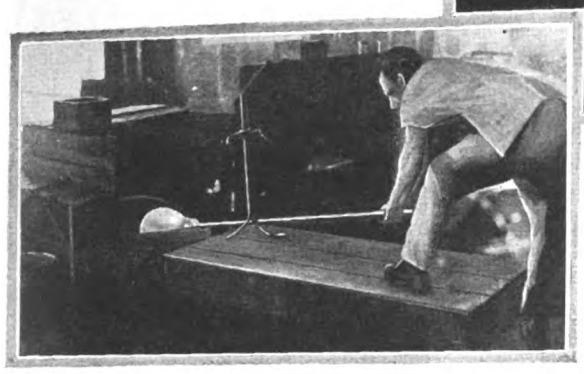
Polishing is accomplished on another revolving table in a similar manner, the medium being polishing rouge, instead of the rougher emery.

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Window glass, as distinct from plate glass, is blown, not cast. Below, the glass-blower is shaping a mass of molten glass for blowing.



Below — After having shaped the "gather," this man is starting the blowing process which is to produce a cylinder such as that in the center of the page.

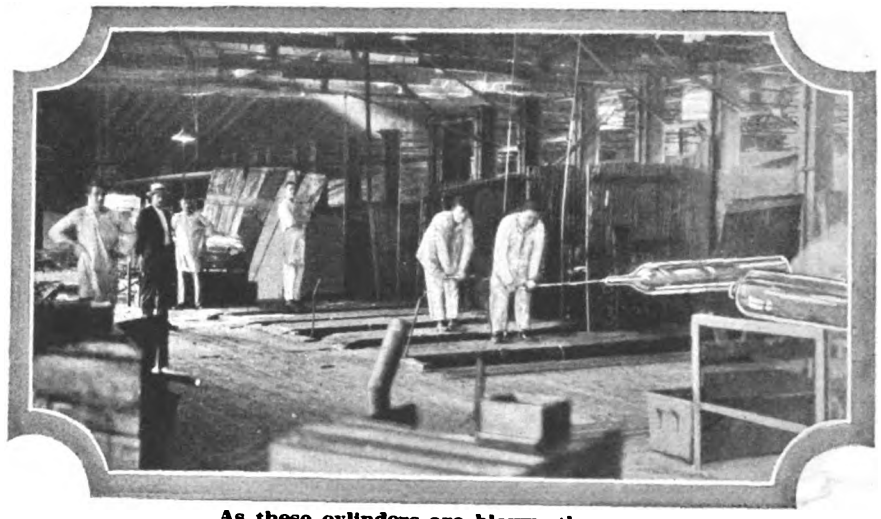


In the window-glass factory, where glass is to be blown "by hand." These men are necessarily highly skilled craftsmen. They are here preparing the "gather" of molten glass, preparatory to blowing.



When ground and polished, each plate has been reduced to one-half its original thickness or even less. At each stage of operations inspection shows a certain proportion of defects which require that the sheet be either cut to smaller size or, in some cases, broken up for remelting.

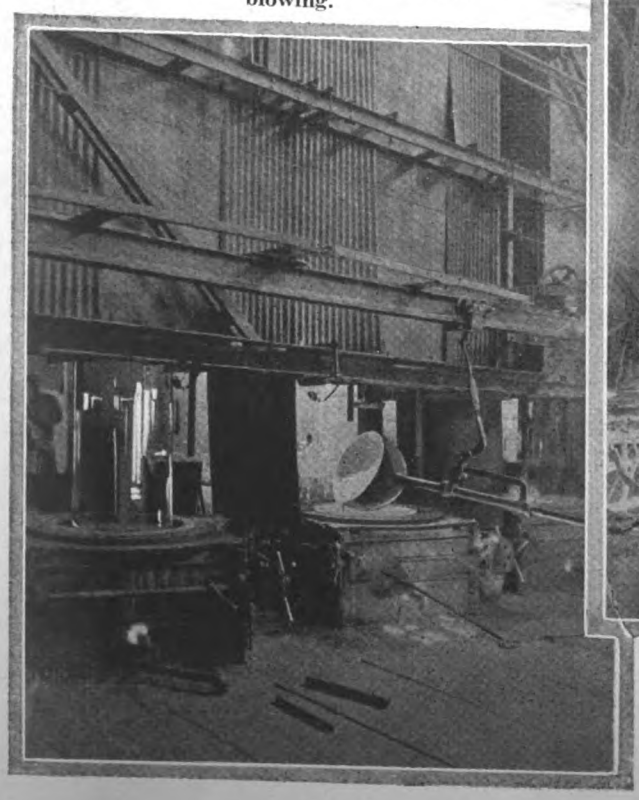
In the making of mirrors, where correctness of image is of any importance, only plate glass will answer the purpose. Window glass mirrors are used only for small, cheap "looking glasses." For mirror making, the plate is first cut to the desired size, and is hand-polished and cleansed. Chemical solution of silver is flowed on, and a deposit of pure metallic silver is precipitated on the plate; this being backed by a protective paint or varnish. For beveled mirrors, the edges are first rough-ground, then smooth-ground, then polished—by means of wheels such as are shown on page 9.

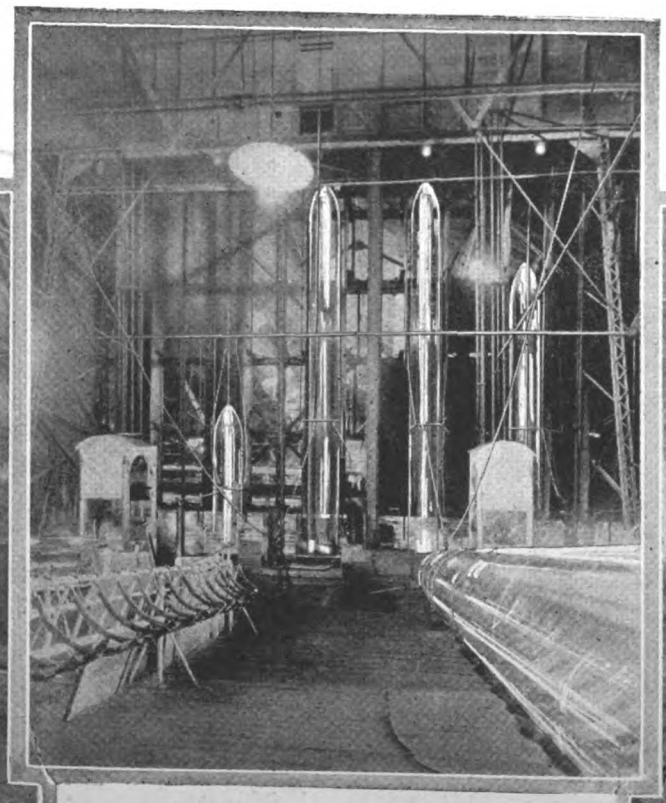


As these cylinders are blown, they must be constantly manipulated and re-heated until they attain the required size.

Wire glass is made either by flowing the glass over and around the wire, which is placed in position on the casting-bed; or by forcing the wire into the plastic glass on the bed. In either case, the glass is cast and rolled. If the product is to be ribbed or figured, the roller impresses the desired pattern; if polished wire glass, the plate goes through the same grind-

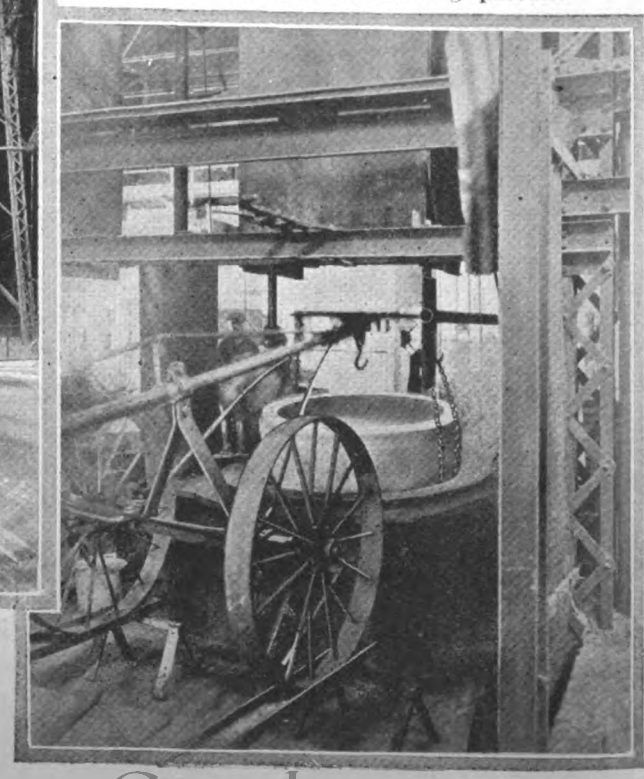
Below—"Machine-blown" window glass supplants the human lungs by compressed air. Here, molten glass is being poured for machine blowing.





Machine-blown cylinders can be made of greater size than hand-blown; these cylinders are approximately 40 feet long.

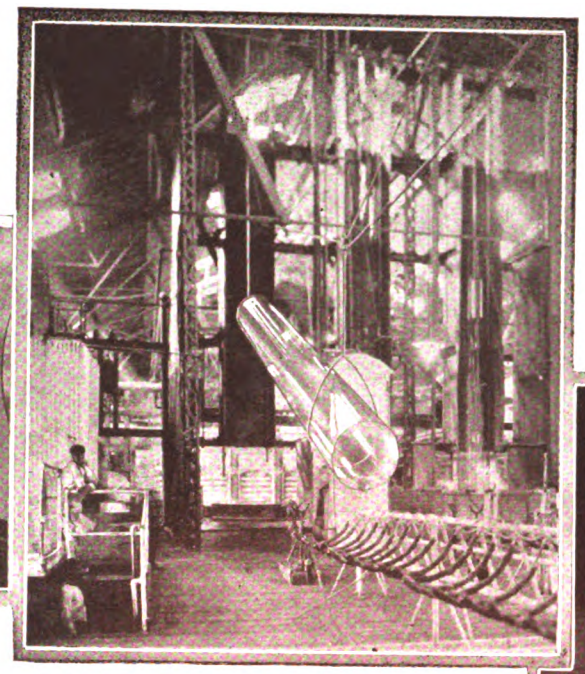
Below—Setting a pot in place for the machine-blowing process.



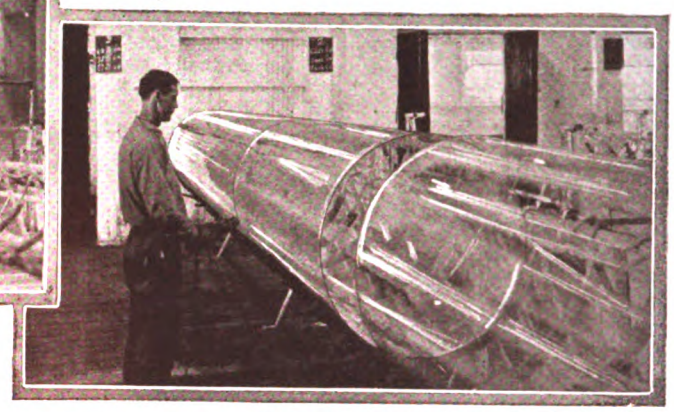
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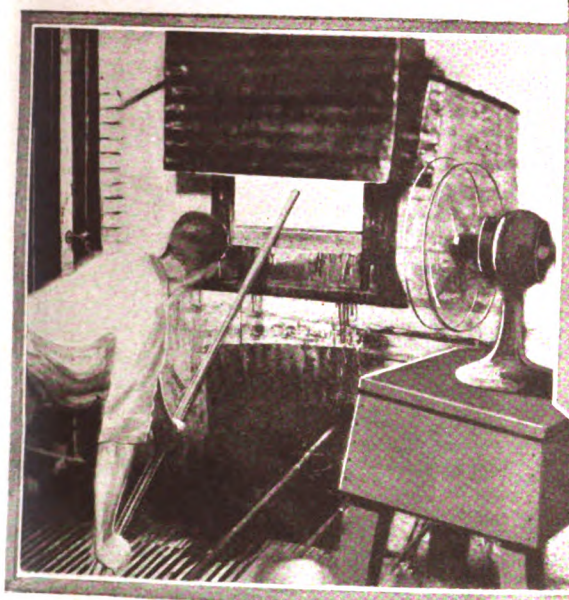
After dividing (see picture at the extreme right), each section of a cylinder must be split longitudinally.



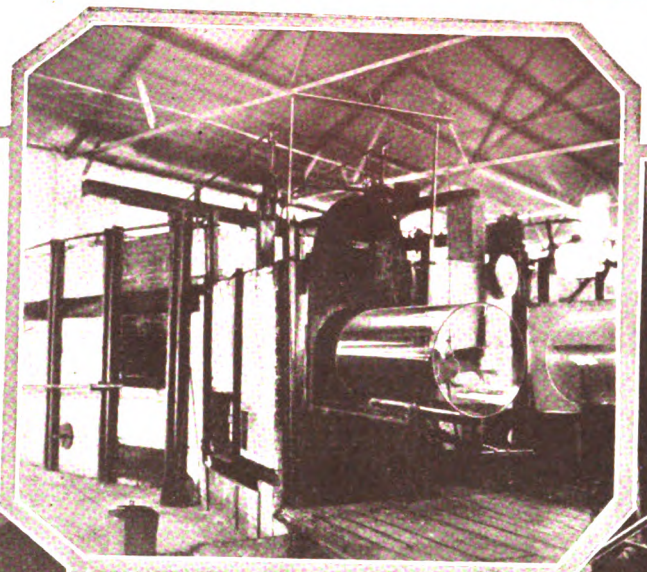
At the left—After attaining full size, the cylinder is lowered onto a cradle, to be divided into short lengths.



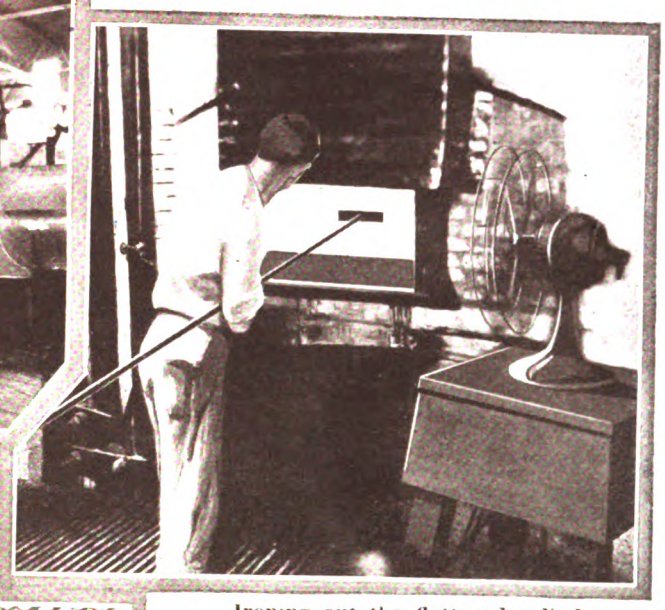
Dividing the long cylinders is accomplished by the use of an electrically heated wire wrapped around where the glass is to be cut.



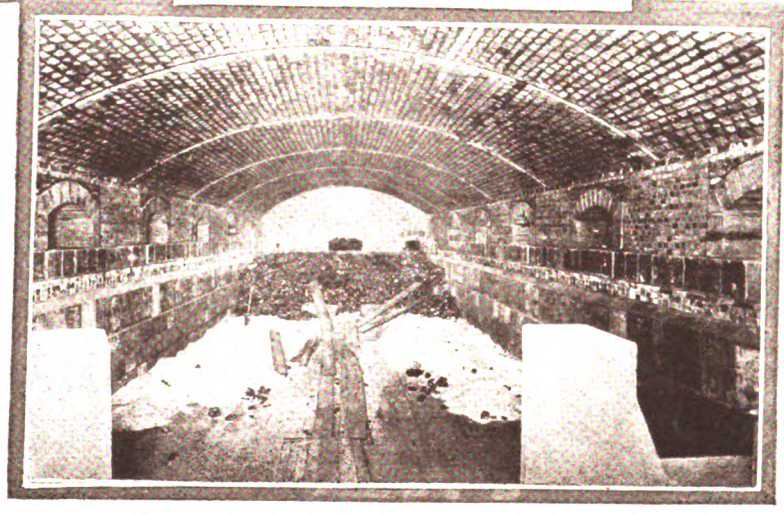
The split cylinder is carefully flattened out as it becomes pliable in the oven.



After splitting, each short cylinder is placed in a flattening oven, where it rests on a flat stone.



Ironing out the flattened cylinder. It is impossible to produce absolutely flat glass except by casting.



The interior of one of the largest glass furnaces in the world. Built for the manufacture of wire glass, with a capacity of 600 tons of molten glass.

ing and polishing operations as ordinary plate glass.

Window glass, as shown on pages 10 and 11, is made by two different methods: The so-called "hand-method" and the "machine method." There is also a process for "flat-drawing" direct from the glass oven, but this method has not yet reached the stage of great commercial importance.

By the "hand method," molten glass is gathered in a ball on the end of a long, hollow tube. The blower shapes this "gather," and by alternately reheating and blowing (by lung-power), produces a cylindrical flask. The thickness of the cylinder walls determines the thickness of the finished glass, and is controlled by the blower, who is necessarily a highly skilled craftsman.

By the "machine method," compressed air furnishes the necessary pressure for blowing, and cylinders can be produced up to 40 feet long—five or six times as long as by hand, and in a fraction of the time. The pots, however, must be set in especially designed equipment for machine blowing. This method will probably supersede the other as fast as the installation of equipment is justified by increased demand.

Whether hand or machine blown, the cylinders are divided into convenient lengths (the ends being first cut off), and are then split longitudinally, as shown on page 11. Each split cylinder is then pushed into a flattening oven, where it rests on a flat stone.

Under the influence of heat

(*Continued on Page 46*)

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Collection Letters That

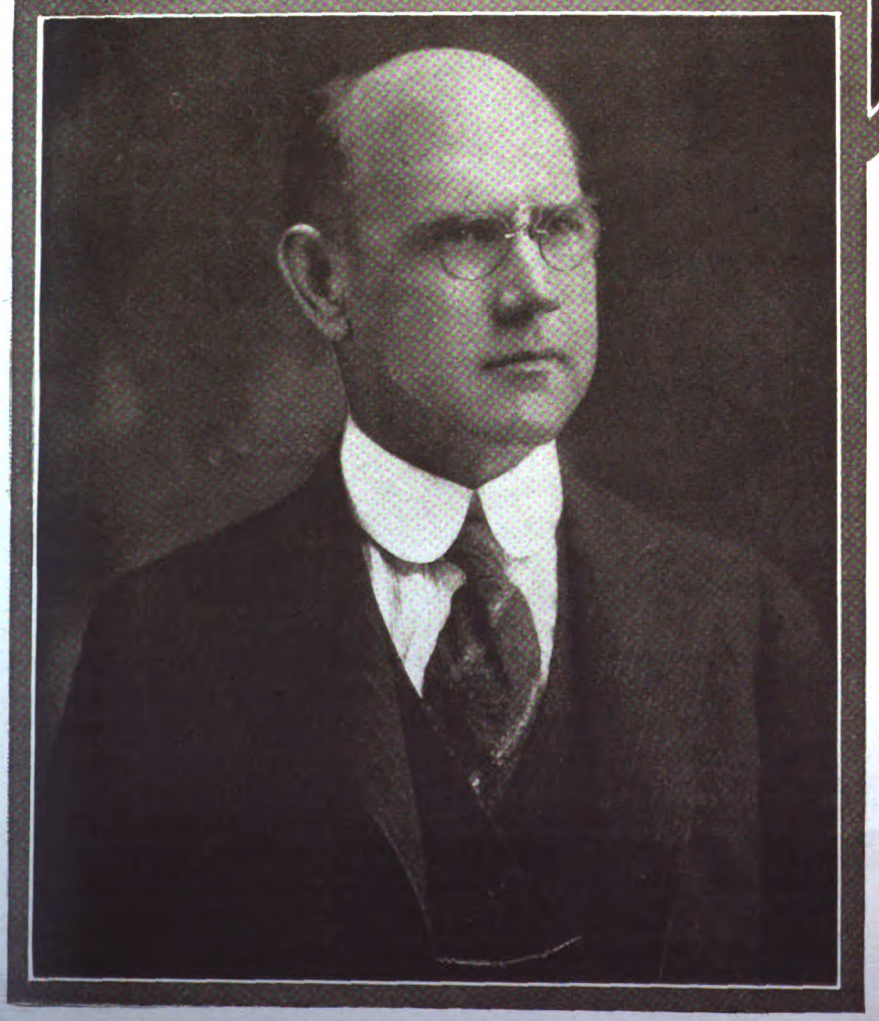
Some Payment-Pullers Selected

Maurice T. Fleisher, President of the NotaSeme Hosiery Co. graduated from the University of Pennsylvania in 1908. He entered the business of which he is now chief executive in the first year of its development in January 1909, devoting himself principally to office and credit management. He was elected President of the Company in 1917. He is Second Vice-President of the Philadelphia Association of Credit Men.





H. Uehlinger, Credit Manager of the Hilo Varnish Corporation of Brooklyn, is Chairman of the Business Service Committee of the National Association of Credit Men. He is a former Vice-President of the New York Credit Men's Association and also Ex-President of the Paint & Varnish Credit Club. Mr. Uehlinger believes that there is no such thing as the one best collection letter.



Herbert E. Choate, Treasurer of the J. K. Orr Shoe Co., Atlanta, Ga., has served continuously for fifteen years as a member of the Board of Directors of the Atlanta Association of Credit Men. For three different terms he was President of the association. For the past eight years he has been a member of the Board of Directors of the Atlanta Freight Bureau, and President for two separate terms.

DURING this period of "economic readjustment" as the economists call the present day slump, the Collection Department finds itself faced with unusual difficulties and responsibilities. Cash must be pursued and enticed with the same degree of wariness and strategy, keenness of intellect, intuition and resourcefulness that the trained sportsman needs to capture the wily brook trout or the mountain goat.

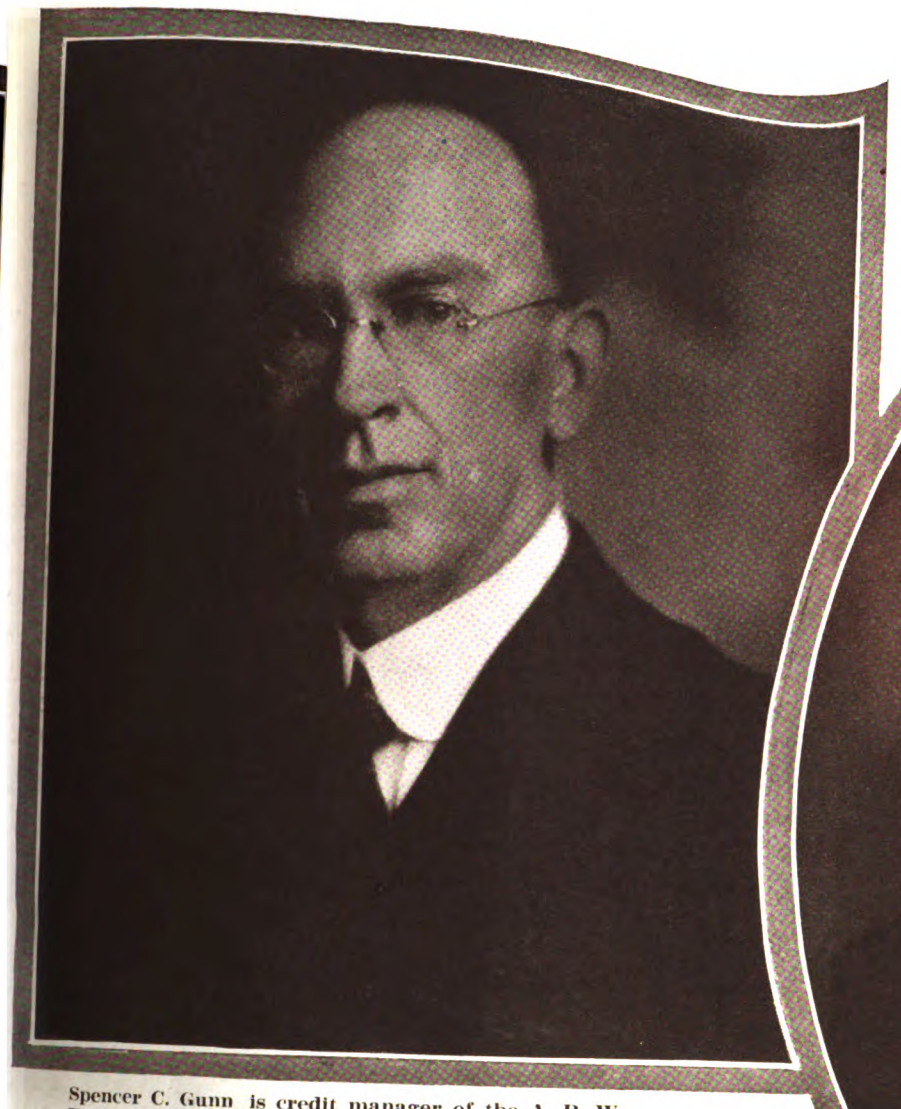
So today the "collection letter" takes on new interest and importance, and while it is of course impractical (since conditions vary with every individual and industry), to hold any one such letter up as a definite model, it is of interest to see what sort of letters prominent credit executives are finding successful today.

H. Uehlinger, the Credit Manager of the Hilo Varnish Corporation of Brooklyn, says: "There can be no such thing as *one best collection letter* for the reason that there are two million names in Bradstreet's and Dun's, and that each business man must be appealed to according to his intelligence or his ignorance. Credit Department

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Tha Get The Money

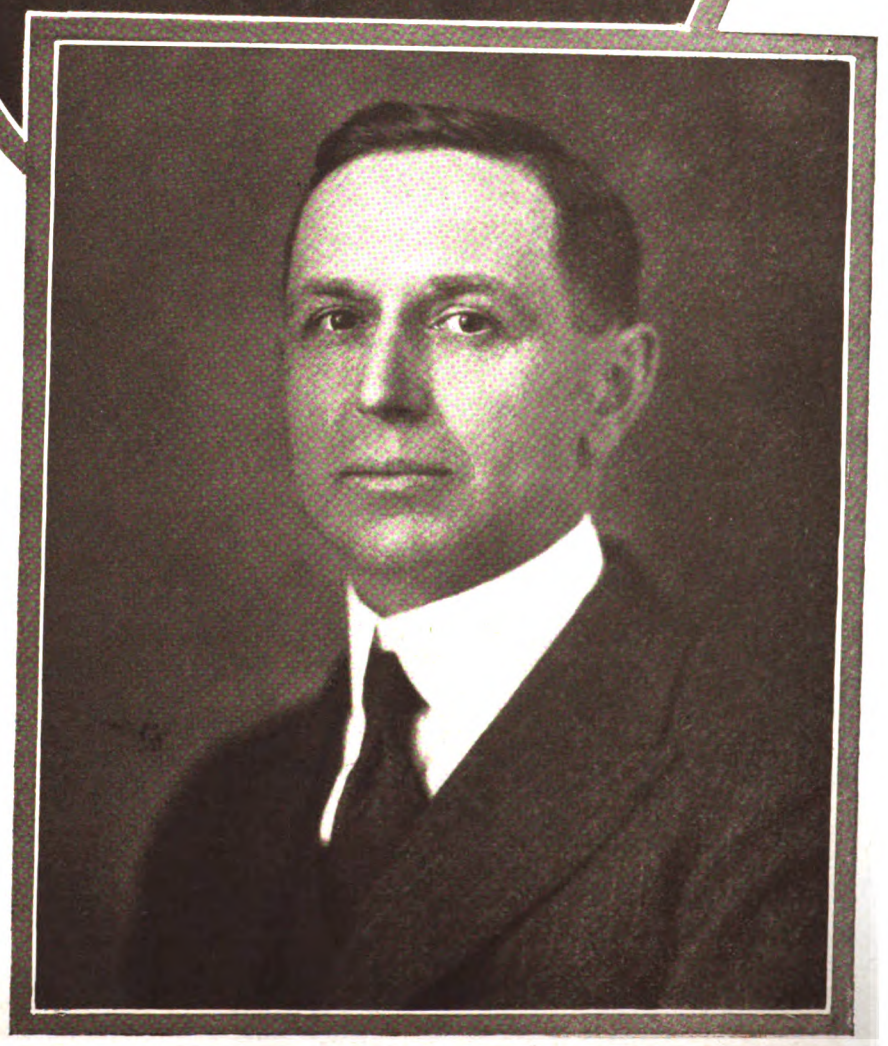
Selecta by Prominent Credit Executives



Spencer C. Gunn is credit manager of the A. P. W. Paper Company, Albany, N. Y. He graduated from Cornell University in 1901; became auditor of the A. P. W. Paper Company in 1912, and in 1917 was made credit manager. He was the secretary of the Albany Association of Credit Men 1918-1919; representative 1919-1920 of the State Legislative Committee; president of the Albany Association 1920-1921.



E. G. Leihy, credit manager of the Blumauer-Frank Drug Company, Portland, Ore., started as a bookkeeper for a lumber company. Three years later he became auditor for a railroad company, then became second lieutenant of volunteers during the Spanish American War. For four years he was auditor of the Marshall Wells Company's branch at Portland, Ore., and for eleven years has been credit manager of the Blumauer-Frank Drug Company.



Technique requires that in insisting upon payment of an overdue account, the demand be made with the sole purpose of collecting money and retaining the customer's good will.

"Now and then a letter, or several, are constructed which have the necessary 'pulling' power. All credit men are perfectly willing to pass such letters to their fellow workers, so here is letter No. 1 which follows the statement that was sent when the bill was due."

Mark Withers,
Pittsburgh,
Pa.

Dear Sir:

The bill of goods which you purchased last month amounting to $50.00 is owing and past due, as will be seen from the duplicate statement enclosed.

Please verify the correctness of the amount and send check in settlement not later than next Tuesday.

Yours respectfully,

"This is a simple reminder conveying a demand and a specific date when payment is expected.

"If unanswered the day after the time limit, letter No. 2 is sent, which reads as follows:

(*Continued on Page 50*)

Carl F. Miller, Assistant Secretary and Treasurer of the Sanitary Food Manufacturing Company, served for five years in the Traffic Department of the Northern Pacific Railway before becoming connected with his present company. He is Vice President of the St. Paul Association of Credit Men and has been a delegate of several National Association Conventions.

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Getting 100 Per Cent from the Delivery Fleet

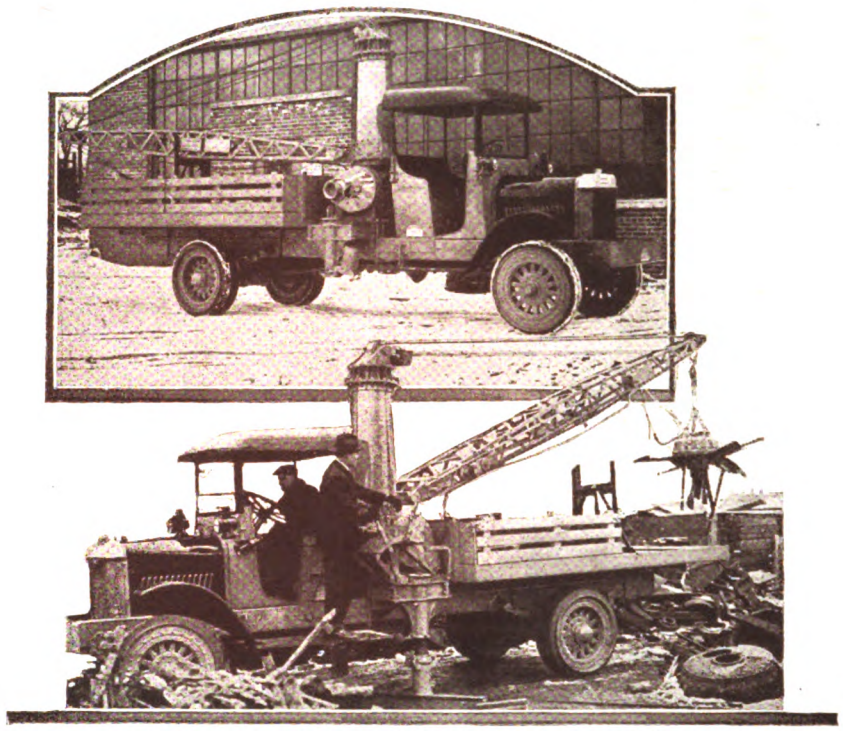
Maximum Production and Service from the Motor Truck

IN the September number of *Industrial Management* Mr. Rollin W. Hutchinson, who is conceded to be an expert on motor truck engineering and applications, makes the statement that "More than 250,000 of the million motor trucks in the United States still spend a third or half of their working day with their wheels not turning. *There is rarely any given set of truck-operating conditions in which the motor truck cannot be made to earn more profits or save more money, if serious study is given to the method of operation, including routing, dispatching, loading and unloading.*" (The italics are ours.)

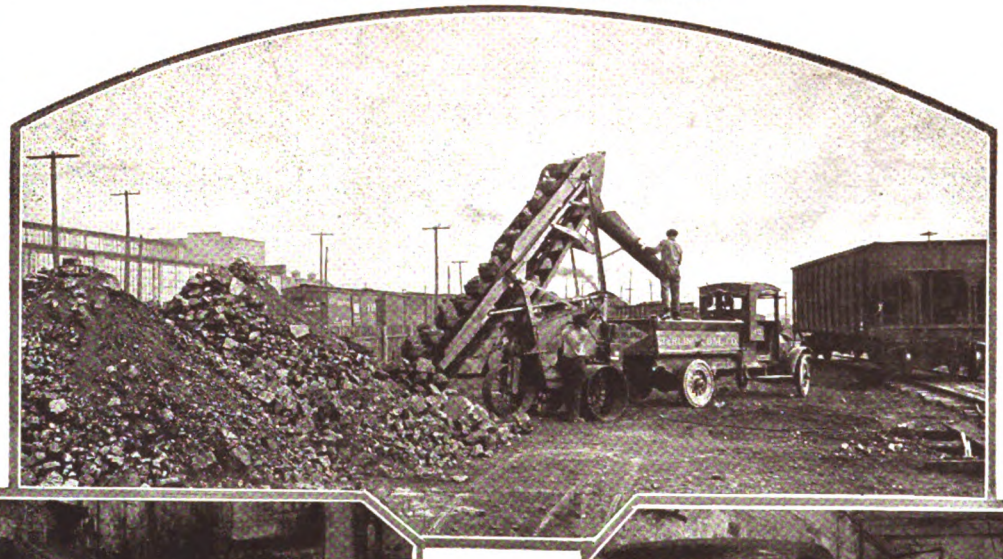
The motor truck has long since passed the experimental stage; it has achieved a recognized position in the transportation field. But in its operation, too often we lose sight of the fact that the motor truck is only performing its function when it is actually engaged in transporting its load. At all other times, whether laid up for repairs, waiting for a load, waiting to be unloaded, or travelling empty, the truck is wasting time which should be occupied in "earning its keep."

That the wasteful operation cited by Mr. Hutchinson is not due to a lack of practical solutions to the problem, is shown by the wide variety of devices pictured on these pages. It is due, rather, to that "mental inertia" which Thomas Edison has so often spoken of as the chief obstacle to human progress. It is not difficult to convince the average man that his truck operating wastes can be materially lowered; but to get him to *act* on that conviction, is another story.

Probably all of us have noticed at one time or another a number of delivery trucks



This crane, mounted on a motor-truck chassis, is doing yeoman service in so many ways that enumeration would be difficult. Note the jack; which gives stability while the crane is in use, and which folds up when in transit.

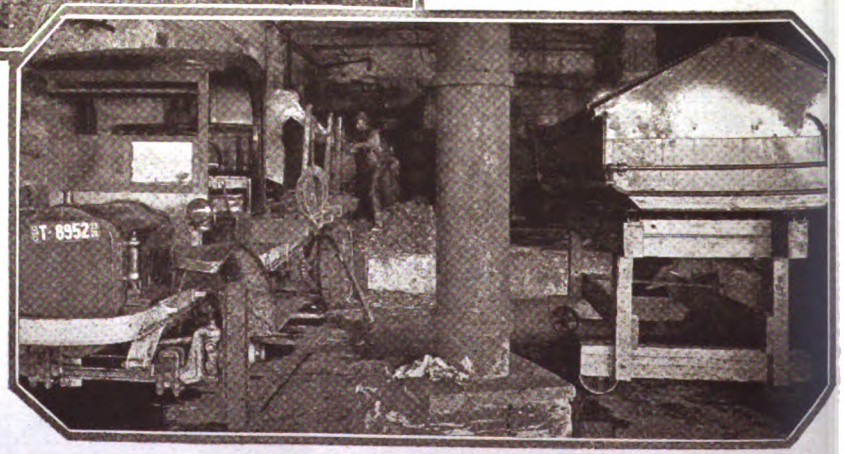


Ground-storage of coal will probably never be entirely supplanted by overhead storage. But that doesn't justify the wasteful shovel-gang.

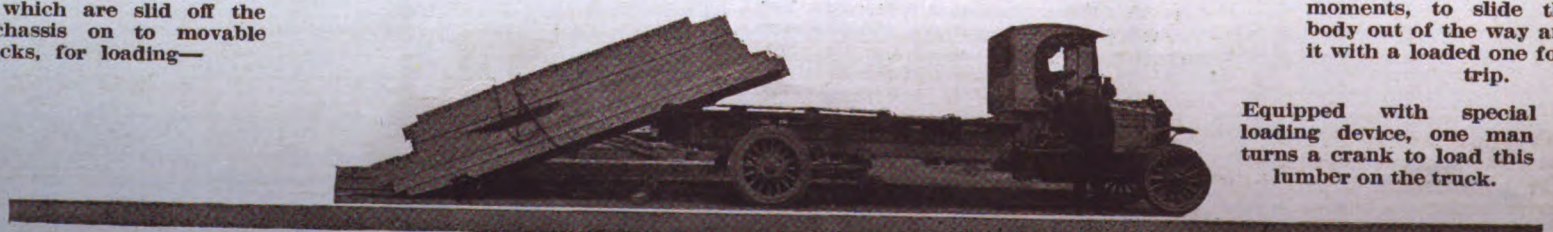
Even the smaller retail coal dealers have begun to use portable loaders, which load a truck quickly, and screen the coal.



A provision company has found it profitable to use demountable bodies, which are slid off the truck chassis on to movable racks, for loading—



—It is a matter of only a few moments, to slide the empty body out of the way and replace it with a loaded one for the next trip.



Equipped with special loading device, one man turns a crank to load this lumber on the truck.

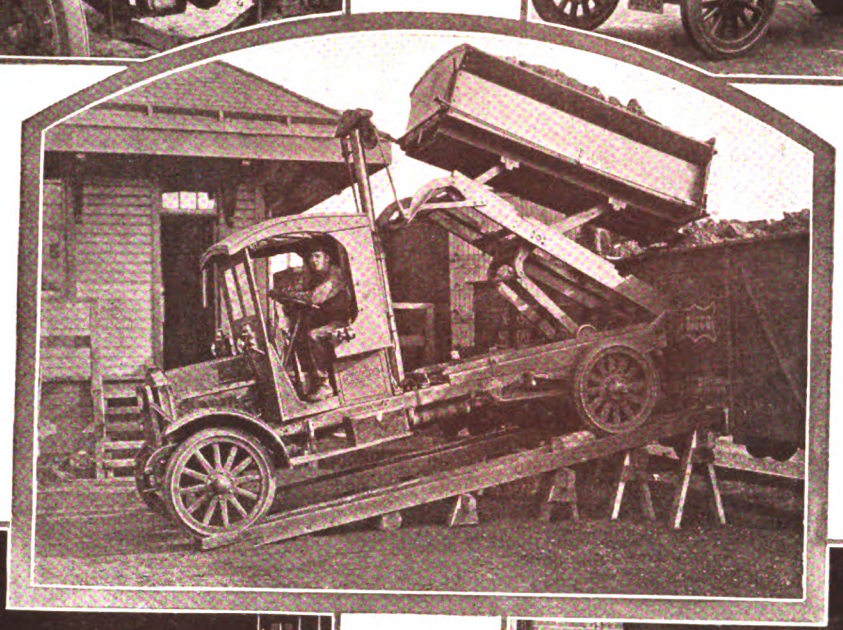
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Mounting a crane on this motor-truck, a small orange-peel bucket is ideal for manhole work; the truck-motor furnishing the power.

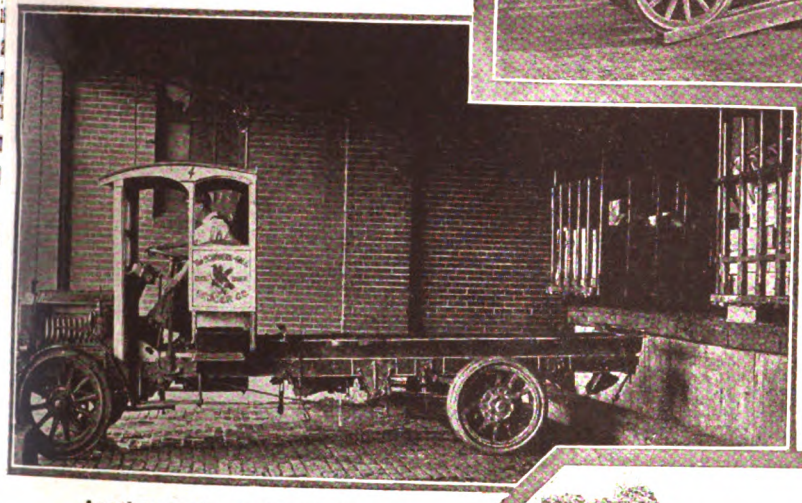


This ingenious truck-body was designed to handle material, of light weight and consequent bulk, in carload lots.



The practical worth of the telescopic dump-body is clearly shown when—

—we compare this method with the old one of shovelling by hand from truck to car.



Another method of handling demountable bodies at the shipping platform—



—An overhead trolley hoist transfers the bodies from truck to platform and vice versa.

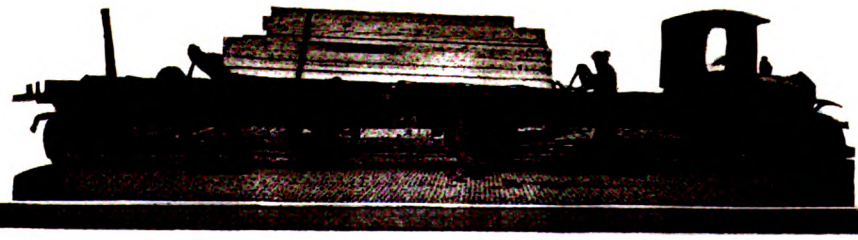


These four-wheel trailers are loaded with scrap-metal shavings while the truck is busy with another load. Note the couplers, which permit rapid picking up of trailers by the truck.

lined up at the shipping entrance of a department store, or at a provision market, or any one of a dozen similar shipping points. These trucks were lined up, idle, being loaded. Why? A certain large proportion of aggregate waste time is inevitable where the truck makes deliveries of fractional parts of its load at different points. But is not that inevitable waste all the stronger reason for doing away with preventable waste at the loading end?

Take an instance of another sort, which came under the observation of the present writer while living in a small town in central New York. Coal prices in this town were always quoted by the local dealer "plus cartage." This cartage charge was $1.50 per ton just previous to the time when the dealer replaced his horse trucks with motor trucks. Six months later, as a result of quicker deliveries (and therefore more per day) made possible by truck, the cartage charge to customers was reduced to $1.25 per ton. This dealer then installed a portable loader similar to that shown on page 14. The fol-

(Continued on Page 44)

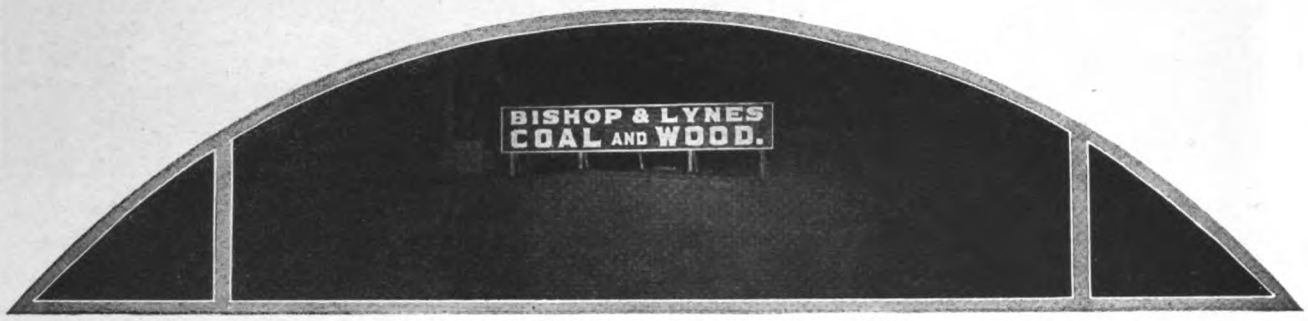


The same loading device as on the opposite page, is here transferring a load from trailer to truck.

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"Do It Electrically" Applied to Merchandising

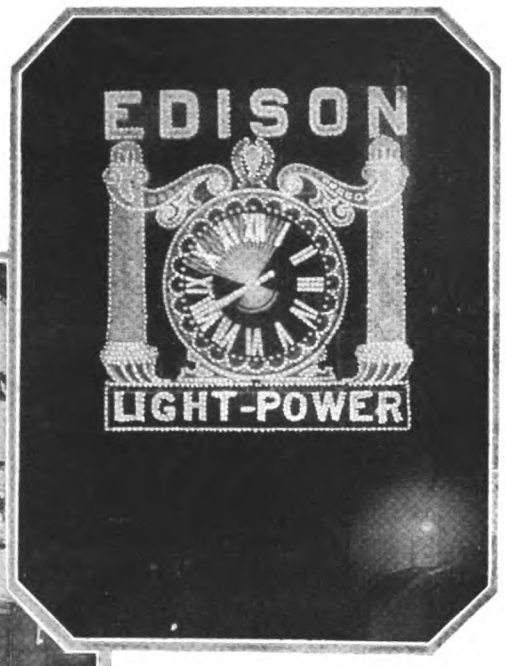
Clever Electrical Devices that Attract Purchasers



A single 500 watt Mazda lamp with parabolic reflector makes this sign stand out at night with startling distinctness.

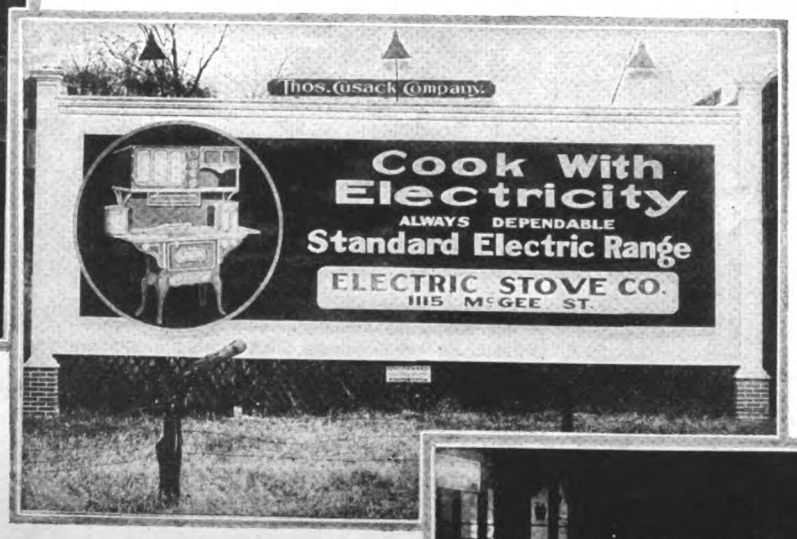
Below—the holiday atmosphere inevitably stimulates sales, and electricity gives the touch of light and color that adds to the appeal.



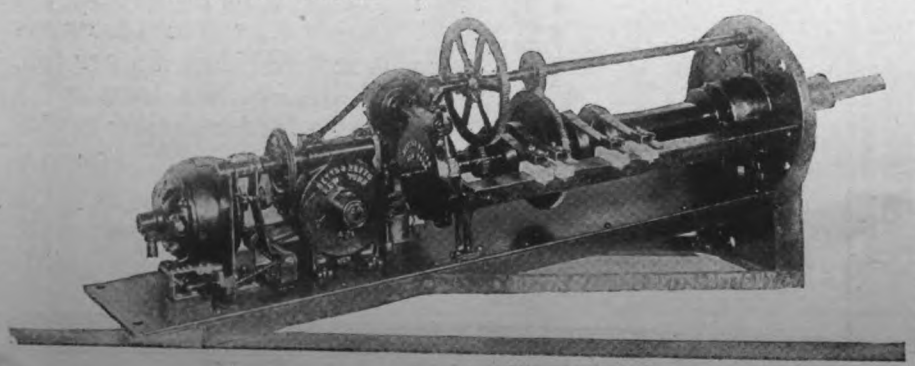


Every hour of the night, as well as by day, you are reminded of the fact that the central station practices what it preaches: to "do it electrically."

Below — The sign-board, these days, keeps late hours for the benefit of night-riding motorists. Incidentally, it has less competition at night in the way of scenic distraction.



Below—One of the beautifully simple sign-flasher mechanisms which enabled the advertiser to "say it with lamps."





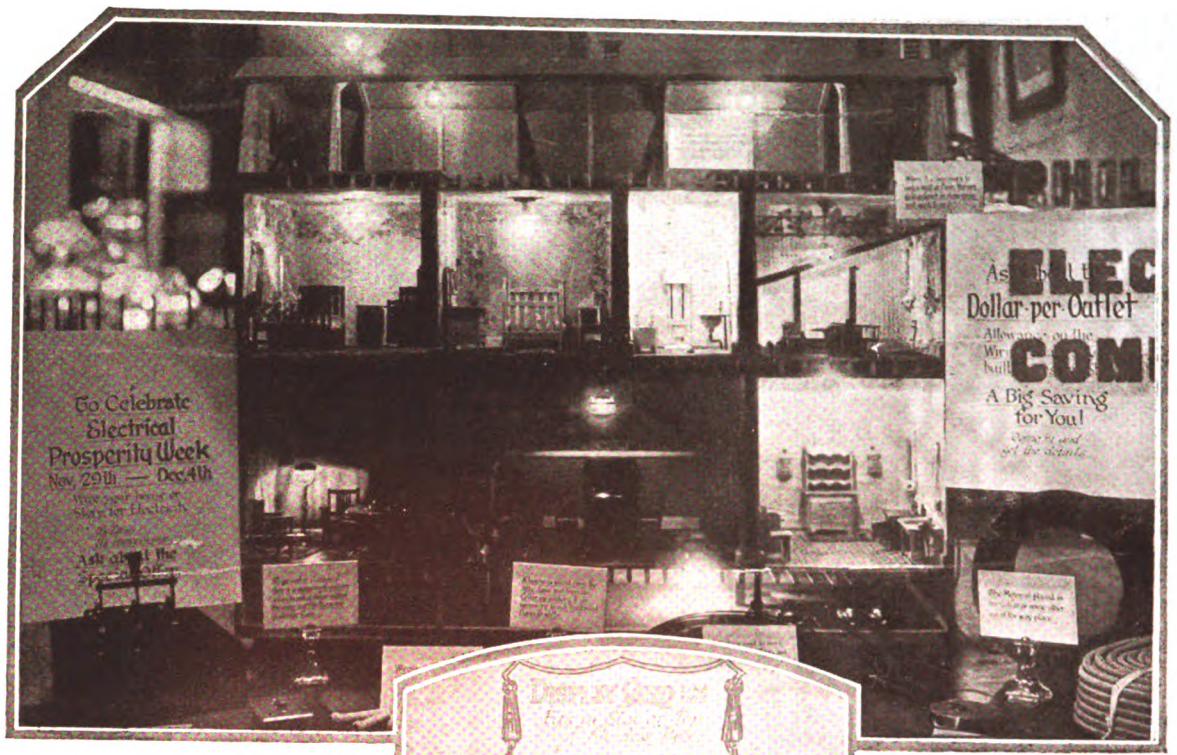
Below—Mounted on an automobile, this sign traveled about Galveston, advertising itself—another instance of practising as one preaches.

THERE used to be a number of clothing stores on Baxter Street, New York City, each of which employed a man whose job it was to get customers into the store. The chance passerby who was unfortunate enough to look like a "prospect" found himself not merely invited to enter, but often actually propelled inside against his will. The theory was sound: get a prospect into your store, and salesmanship gets a chance to function. The method, however, was a little too crude to be widely applied; and it was likely to put the prospective buyer in a frame of mind far from receptive.

Nevertheless, the retail merchant is always faced with that same essential problem—to bring people into his store. His newspaper and billboard advertising and his show-window display are directed to that end— to bring people inside, where a combination of attractive display and good salesmanship can translate interest into desire, desire into action.

In seeking pictorial examples of electrical aids to merchandising, we knew, of course, that the electrical industry itself was the outstand-

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To put across the idea of the advantages of electricity in the home, this miniature model of a house interior more than paid for itself.

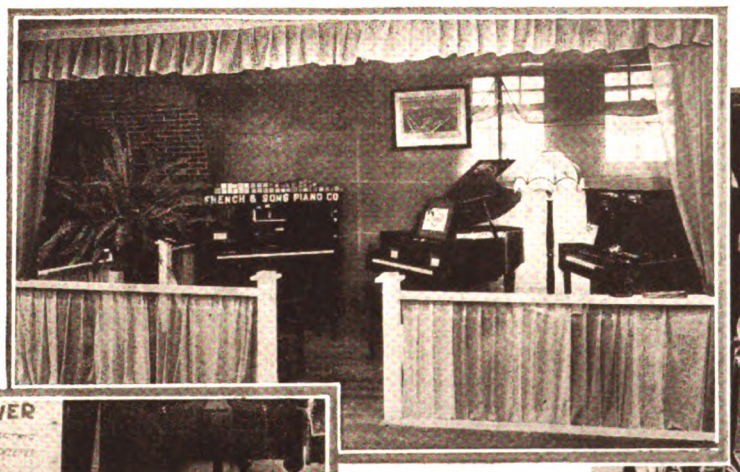
ing example. It is not surprising that this should be so; but it is surprising that other industries should be so far behind in putting electricity to work. Admittedly, the three elements, light, color and motion, are the most effective agencies of appeal to the human eye; yet how many merchants fail to make full use of these elements in attracting purchasers.

Good lighting can make all the difference between a busy store and a tottering enterprise. In this respect, through the unremitting missionary work of electric lighting companies, practically all merchants have fallen in line. There are still some stores where a glare of light is mistakenly assumed to be good lighting, but these are the exception rather than the rule. Much remains to be accomplished by attention to interior lighting; as shown, for example, by the millinery display pictured on page 18.

The immense animated electric signs are such a familiar sight as to require no reproduction here. But for the business which does not justify such elaborate display, there are other ways of letting the world know about it, at night as well as by day. Not only the illuminated sign

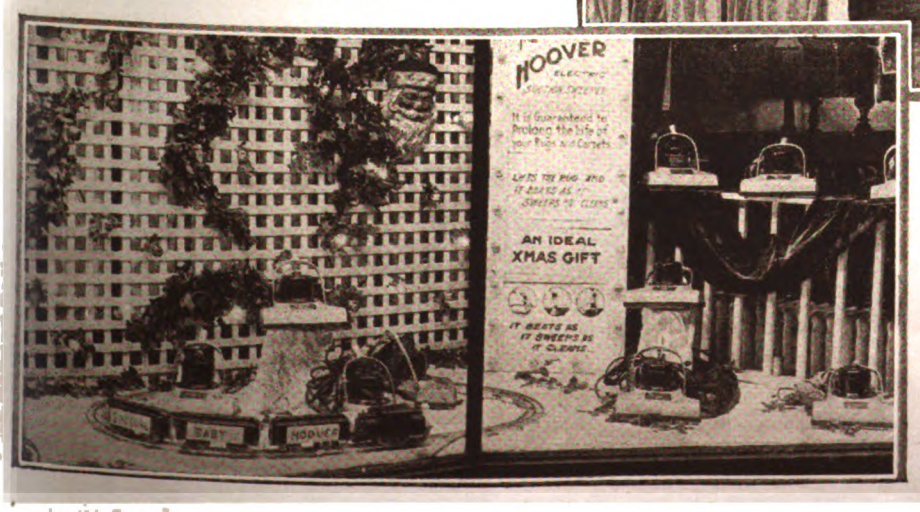


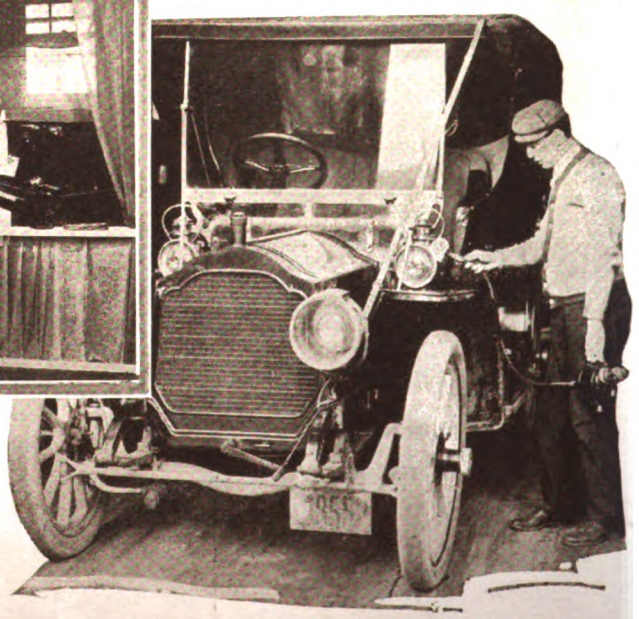
Above is a recently developed "animated picture" display which, without mechanism, gives the passer-by an impression as of alternately flashing two distinct pictures on the screen—as shown at right and left.



The electric floor-lamp gives just the touch to complete the "home-like" setting for a piano.

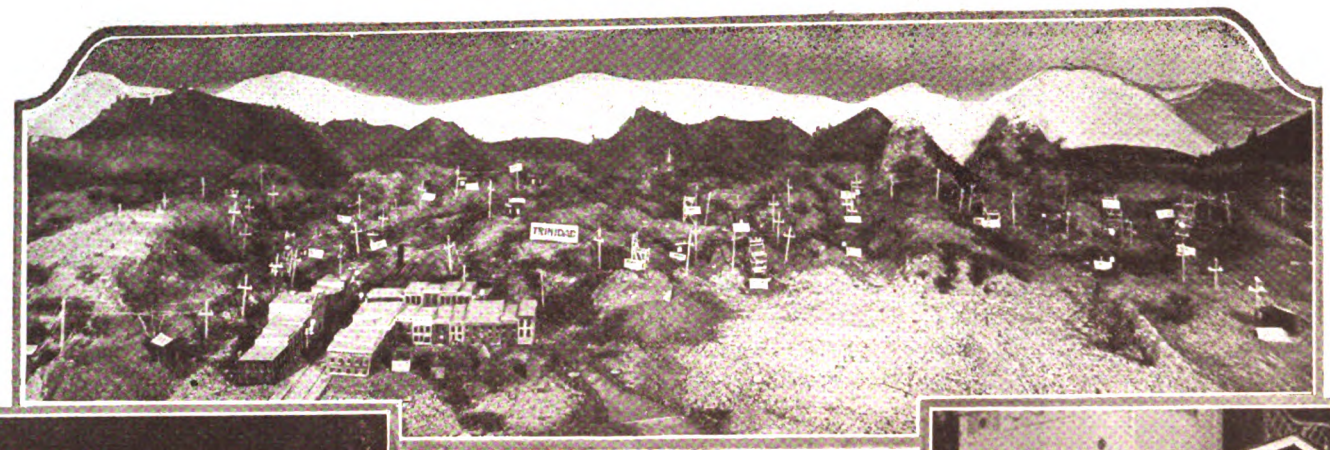
The toy electric train is often used to sell itself. Here, its mission is to attract attention to a display of vacuum cleaners.





This enterprising garage has found that it pays to buff up the metal parts of your car while you are getting gasoline and oil.

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A central-station constructed this miniature for their show window, to give customers and prospective customers a better idea of its service.

Below—Behind the face of the Metropolitan Tower Clock, New York. The lights are reflected, by the white surface at the right of photo, through the transparent numerals on the dial at the left.



The "electrical home," in San Francisco, illuminated by flood-light, to attract visitors to the interior; which was equipped with every modern electrical device for home comfort.

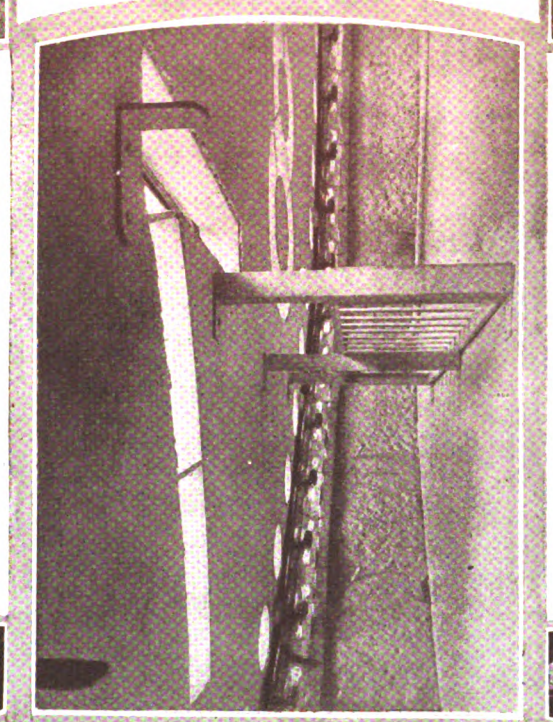


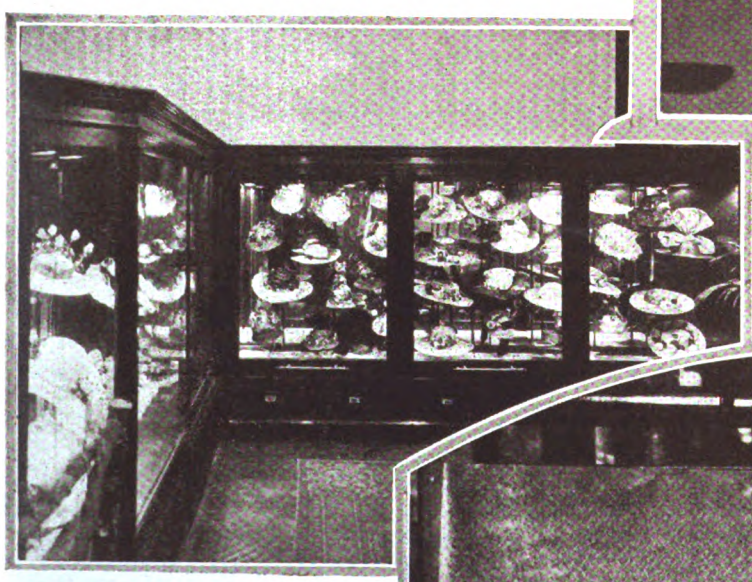
The Real Estate man, builder and building-supply man might stimulate interest in their wares by such means as this.

board, but the flood-lighted sign (such as the one pictured at the top of page 16) reaches possible purchasers with telling effect at night when there is less to distract the eye.

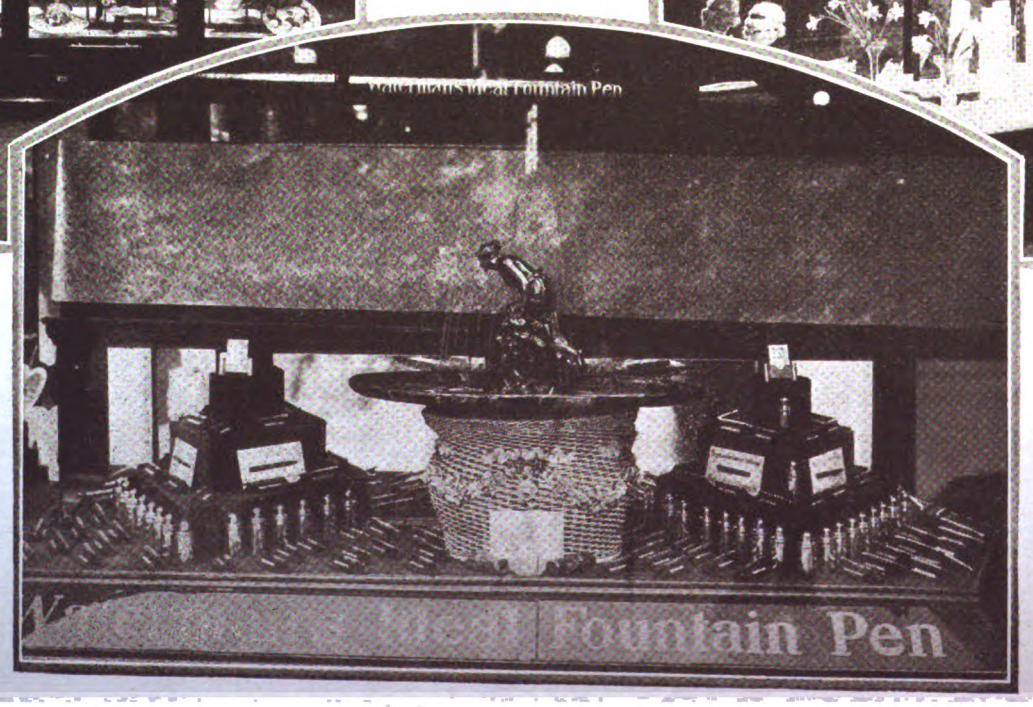
There is no apparent reason why a toy electric train, travelling around a display of vacuum cleaners in a show window, should stimulate the sale of these cleaners; yet sales undeniably increased as a result. A piano is a piano,

(Continued on Page 44)









Note how proper lighting of interior show-cases, with the subdued light in the room itself, throws this millinery display into bold relief.

Above — Ingenious lighting adds to the attractiveness of this stationery, making it easy for the purchaser to make his selection.

At the left—The self-contained electric fountain was especially effective in connection with the display of fountain pens of a well-known make.

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Practical Pointers for Purchasing Agents

A Monthly Page Edited by Harry Botsford, Assistant to the President, The National Association of Purchasing Agents



Purchasing Agents Being Made Directors

By W. L. Chandler, President, N.A.P.A.

A new development has come about of interest to the purchasing profession. Several large corporations have found after their Directors had decided to make certain important changes in their product that they had overlooked questions dealing with the securing of raw materials or finished parts, as well as matters pertaining to cancellation made necessary by the changes.

As a result of these experiences, some of the corporations have elected their purchasing agents to positions on the Board of Directors, so that when important matters of this kind are being discussed they will have in the Board meetings someone thoroughly informed.

In at least one instance, the Board of Directors embraces not only the president, vice president, secretary and treasurer, but as well the following:

Purchasing Agent.
Production Manager.
Sales Manager.
Advertising Manager.
Credit Manager.

It would seem that this is a very sensible arrangement, because such a Board of Directors can discuss a problem intelligently from all angles.

This development is very apt to grow. It throws a great responsibility upon members of the purchasing profession, requiring them to qualify for such positions if called upon.



Mixing Production with Price

By A. H. Reinhardt, 1st Vice-President, N.A.P.A.

Production is too often lost sight of as an essential quality in purchasing; although through our Association work we have to a great measure succeeded in educating the Purchasing Agent to keep in close touch with the operating department and ascertain just how the raw material is moving over the machines.

The day of the old style Purchasing Agent, who said, "This is what I in my great wisdom have bought, and this is what you will use," is rapidly passing into the discard along with the other old style "Your price is too high" type.



The Purchasing Scientist

By L. F. Boffey, Secretary, N.A.P.A.

Yesterday the purchasing agent was an order-writer—to-day he is a trained, qualified executive with intimate knowledge of men and methods and materials.

The modern purchasing department turns its attention to research, so that when the time arrives for actual purchase there is no guess-work involved in the selection of the material or equipment which will best flufill the purpose. A better product, more economically produced—that is the contribution of purchasing science to the broader field of industrial science.



Let's Be Human

By S. F. Woodbury, 4th Vice-President, N.A.P.A.

"Man's inhumanity to man makes countless thousands mourn." How much does this mean to the average purchasing agent?

Salesmen very often think they are not received courteously and go away with resentment in their hearts. They think some of us are cold, prejudiced and unintelligent when we do not make the proper response to their selling arguments. This is not true in the majority of cases as no affront has been intended, and we may have been won over entirely by the merits of the article they seek to sell us. They do not always take into consideration the fact that we have been trained not to commit ourselves, and in general adopt the "Missouri" attitude.

I do think, however, that the average purchasing agent could be more approachable, more congenial and more sympathetic than he now is. This would give him increased knowledge, make a friend of the salesman and benefit his company. The purchasing agent must give to the salesmen that call on him the same gentlemanly treatment which he expects other purchasing agents to give the salesmen or solicitors from his own house, and he should always keep this fact in mind.

A purchasing agent on one side of the desk, a salesman on the other, both human beings, both trying to earn their living, one by buying and the other by selling. They are generally of about the same

(Continued on Page 48)



Purchasing Agents Must Advertise Themselves

By A. V. Howland, 3d, Vice-President N.A.P.A.

Consider the salesman. When he has landed a good order, does he sit quietly planning for the next order? No! His own estimation of his good work is heard far and wide.

Consider the purchasing agent. When he has placed an order that allows the aforesaid salesman to make the aforesaid noise, does he go out and proclaim his efficiency from the house-tops? He does not. He retires to his sanctum and even the office boy does not hear of his good work.

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Making Sales Statistics Talk

Graphic Methods for Stimulating the Sales Force

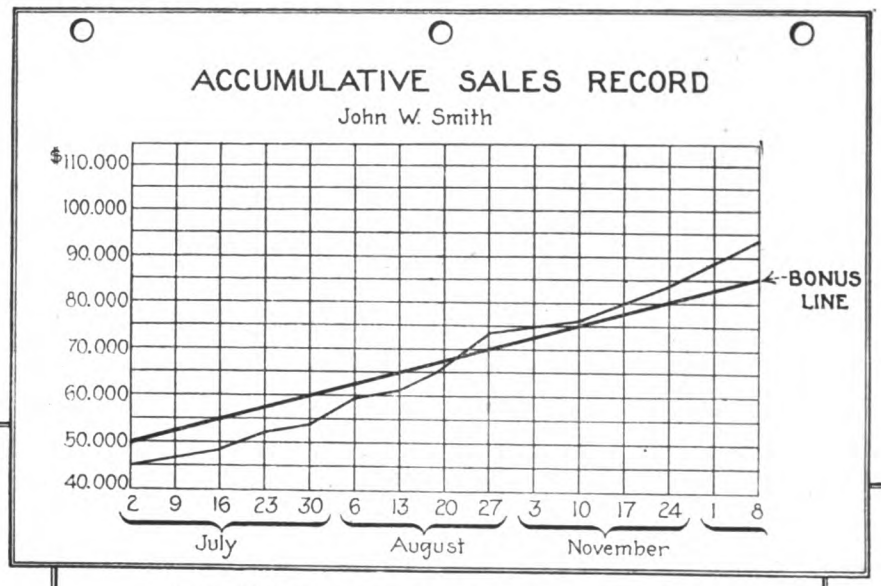


ALL of us old timers remember the days of the "star salesman." We remember vicariously inhaling the aroma of the boss' perfectos, consumed by the aforesaid star on the notable occasions when he visited the office. As far as we could observe, the star worked about one week out of every month. His powers of Personality and Persuasion, however, were so great that he topped the fellows who kept plugging day after day.

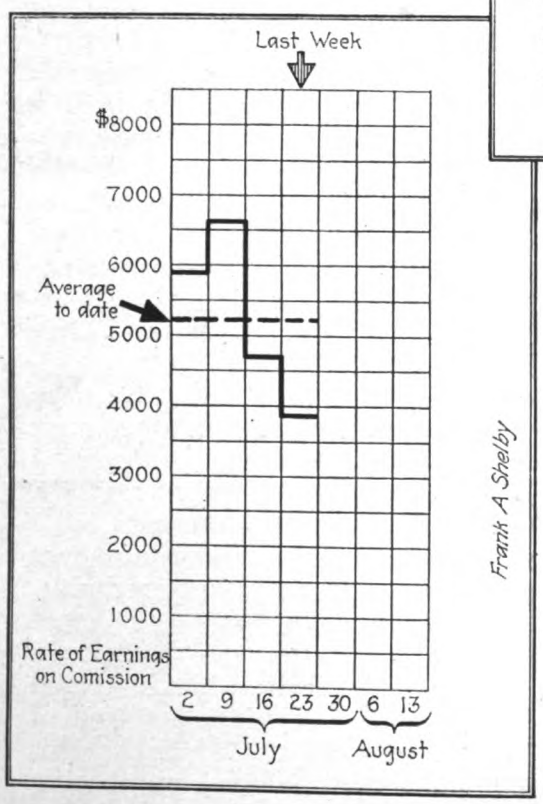
Today very few sales managers would knowingly hire a *star* salesman. Personality and Persuasion are in demand, but only when accompanied by Persistence. The psychology of the star is such that he is more of a comet than a fixed luminary and in addition his idiosyncrasies upset the morale of the sales force.

Personality and Persuasion cannot be developed by graphical methods, but Persistence lends itself admirably to this sort of treatment, and progressive sales managers are rapidly taking advantage of it.

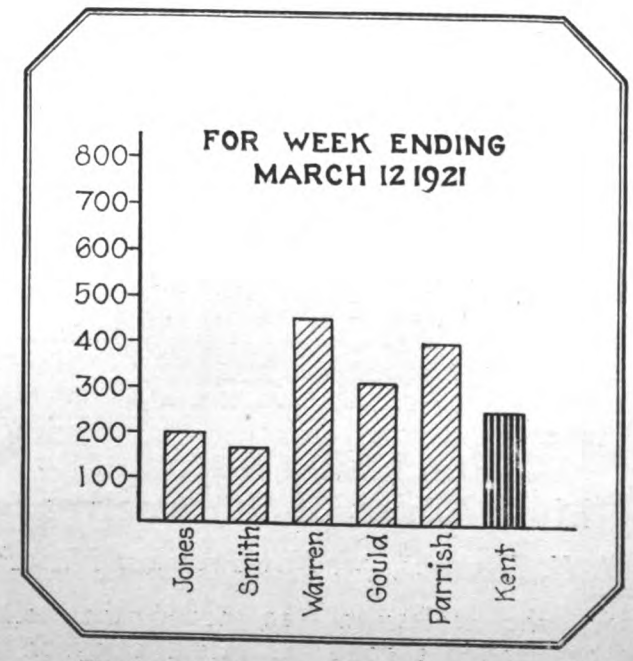
The principle underlying this kind of sales stimulation is the pictorial appeal, the same appeal that is used in this magazine, except that statistics are pictured instead of personalities, inventions or machines. The salesman is made to see vividly exactly where he stands, either in relation to his own previous performance or in relation to the performance of other salesmen. There are so many varieties and combinations that



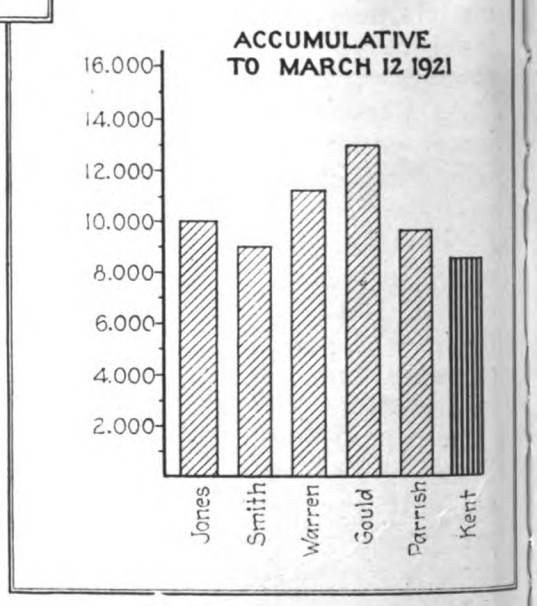
A chart like this, corrected up to the current date, is sent weekly to each salesman. It shows him at a glance whether he is earning a bonus or not, and if he is, whether the bonus is increasing or diminishing. This chart is of the simple "comparative" type, the comparison being in this case against the bonus "peg." It is made to fit the sales book.



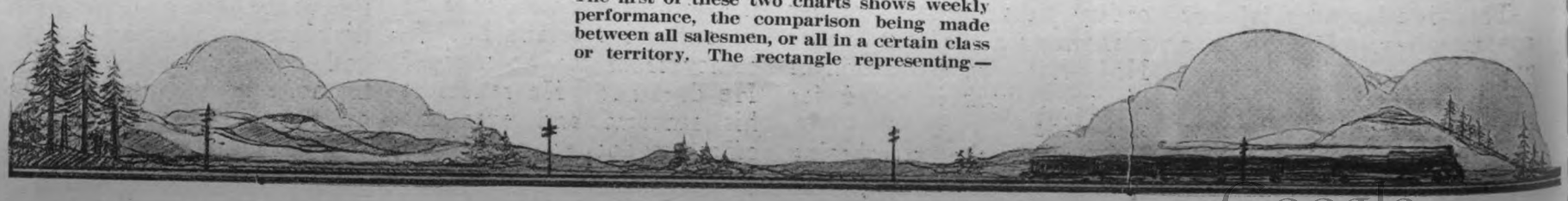
Here is another simple "comparison" chart for salesmen. In this case the comparison is last week's performance against the average to date for the year, half year or quarter. The arrows are put on with a rubber stamp, and a new chart is mailed each week. This chart tells the commission salesman at a glance just what annual salary rate he is earning.



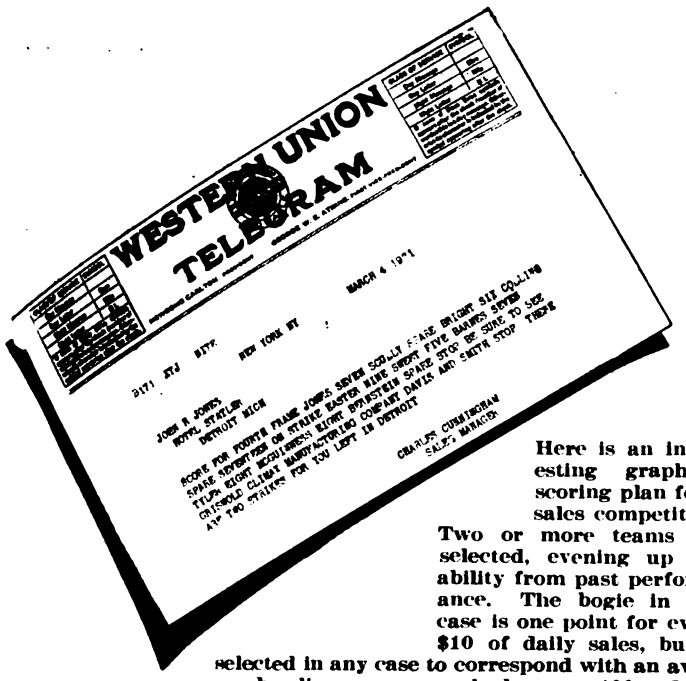
The first of these two charts shows weekly performance, the comparison being made between all salesmen, or all in a certain class or territory. The rectangle representing—



—the salesman to whom the chart is sent is put in black, so he can quickly visualize his performance as against his fellow salesmen. The second chart, on the same principle, shows accumulative sales since the first of the year.



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Here is an interesting graphical scoring plan for a sales competition. Two or more teams are selected, evening up the ability from past performance. The bogie in this case is one point for every $10 of daily sales, but is selected in any case to correspond with an average bowling score, namely, between 100 and 300 points for the ten frames which may represent days or weeks. All sorts of combination prizes may be offered, such as high individual score, high frame score for the team, greatest number of successive strikes or marks, etc. A competition of this sort to be effective must have results posted promptly. In this case, a night letter, such as is shown above, was sent to each team member.

Climax Mfg. Co.
BOWLING TOURNAMENT
MARCH 1ST TO 14TH, 1921

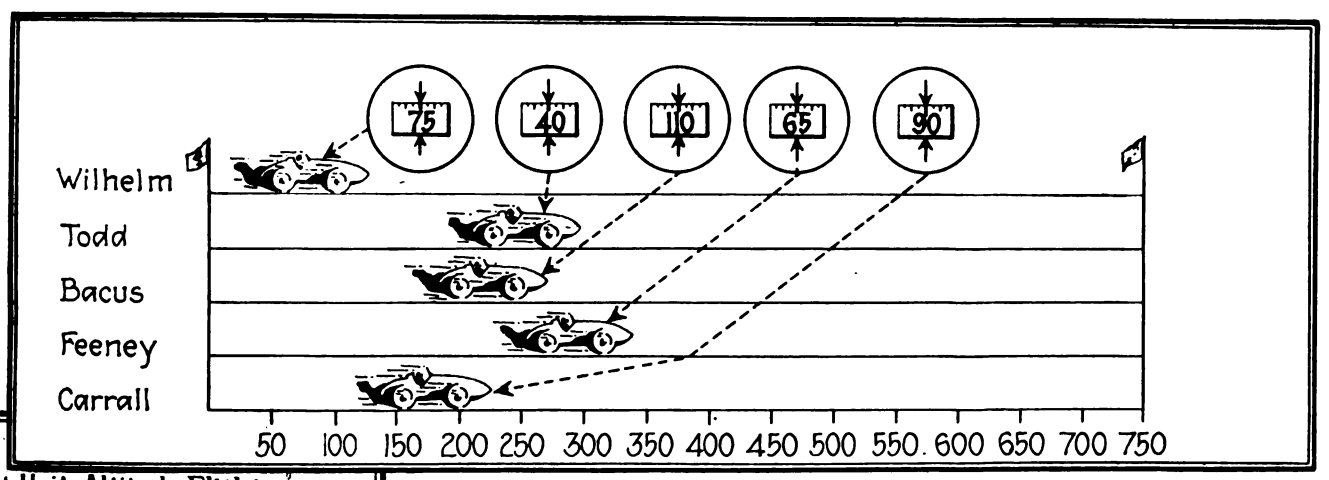
		1	2	3	4	5	6	7	8	9	10
Team #1	J. R. Jones	8	23	40	47						
	W. Scully	20	37	44							
	T. Bright	6	13	20	26						
	Harry Collins	9	17	37							
	Jim Easter	16	22	41	50						
	Total										
Team #2	H.K. Sweet	18	26	34	39						
	W. Barnes	8	17	34	41						
	Fred Tyler	30	56	74	82						
	P Mc Ginnis	9	18	36	42						
	L. Bernstein	7	13	15							
	Total										

Prize for Winning Team, $100.00
Individual High Score, $25.00
Keep your score card up to date from Night Letters
Scoring Rules
One point for every $10.00 of daily sales, up to $90.00 $100 = a Spare
$150 or better = a strike

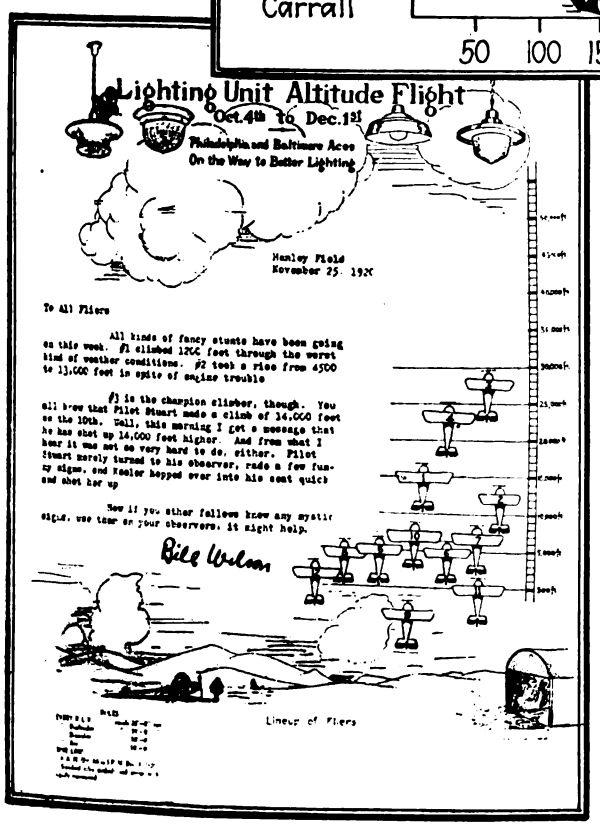
are possible that an ingenious sales manager finds the supply almost inexhaustible. The few shown on these pages will serve to suggest *types* of graphic sales stimulants.

Comparisons with a salesman's previous average or with his individual bonus peg or budget quota, are generally fair. Comparisons of performance with other salesmen should only be made when conditions are equalized. It is universally realized that one territory may yield a given amount of sales while the same selling abiilty and energy applied in another would yield but half as much. Modern point systems and quota systems of rating and apportioning territory equalize these conditions, and where these are in effect comparisons are quite fair.

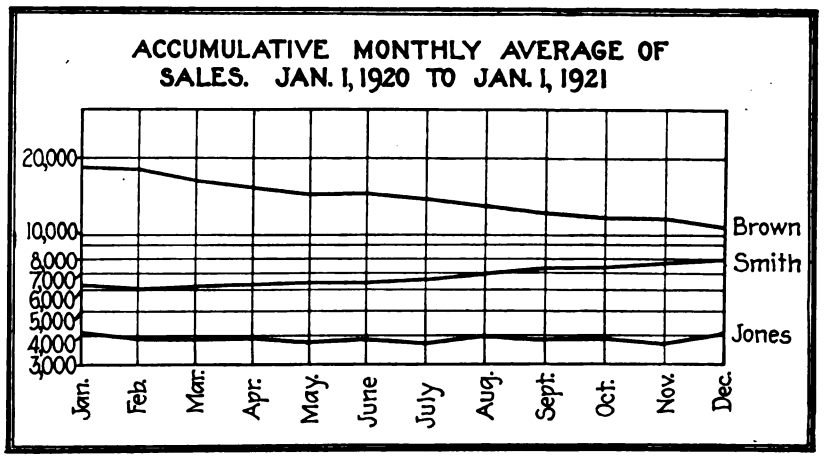
(*Continued on Page 58*)



Here is a graphical competition chart with a double purpose. The distance of each racing car from the starting line indicates the cumulative sales points or dollars while the speedometers above indicate the "rate" of travel for the last period. Thus Feeney, although in the lead, sees that he will have to put on gas to keep Bacus from catching him with his 110-mile clip. Charts of this sort elaborated in scale and planned for the home office, stimulate interest among all employees whether salesmen or not, and add a secondary urge to the salesmen to excel.



Sometimes the graphic record of a competition provides a first-rate basis for a sales letter. Here is an example which has the airplane as its motive and which is very effective in its appeal. Any single motive of this sort kept in operation over too long a period, will grow stale, and there is no excuse for this happening in view of the many varieties of motives available for graphic use.



Where the effort is to develop salesmen rather than to rank accomplishment by gross results, a graphic chart of this sort shows at a glance which man is making the greatest per cent of improvement. Thus Brown, who has the best total sales, is nevertheless going down hill fast, and Jones is plodding along on the level, but Smith is traveling up-hill and appears to be a comer.



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The Passing of the "Roustabout"

The Mechanics of Moving Materials



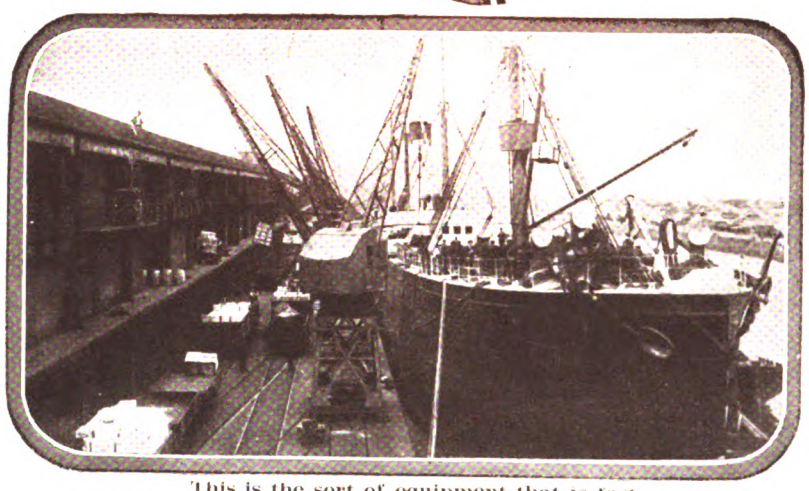
In the Orient, with common labor at ten cents a day, they can still afford to be picturesque; but the picturesque is more attractive to look at than to live.



The old-time hard-working, hard drinking stevedore is passing out. His booze has been taken away, and now even his job is gradually disappearing.

"IT'S what you know—not how strong you are—that counts," said a recent advertisement of a famous correspondence school. And this is becoming more and more true as machines replace human brawn to an ever greater extent, to the benefit of both work and worker.

The "roustabout"—the good old devil-may-care, hard-drinking, hard-working husky—is following the horse into industrial oblivion. His last stronghold, the waterfront, succumbing to the modern demand, is slowly but surely being transformed; and in the transformation, what provision has been made for him?



This is the sort of equipment that is fast displacing human brawn on steamship piers. These cranes may lack "color," but they reduce re-handling costs, dockage, demurrage and general overhead to an extent that materially lowers old H. C. L.

When a dock was simply a place for ships to tie up, the stevedores swarmed all over the place with their hand-trucks, loading or unloading cargo, for all the world like a multitude of ants. But the pier of tomorrow will have no room for these human ants. Tracks, cranes, cargo-derricks—a maze of "orderly disorder"—occupy all the space outside the pier shed. With such equipment, a mere handful of men accomplish with less confusion, in a fraction of the time and at far less cost, what used to be the work of an army of stevedores.

To those who have made a study of the problem of moving materials, the only mystery is the slowness with which the inevitable trend progresses. There are still so many cases where either ig-

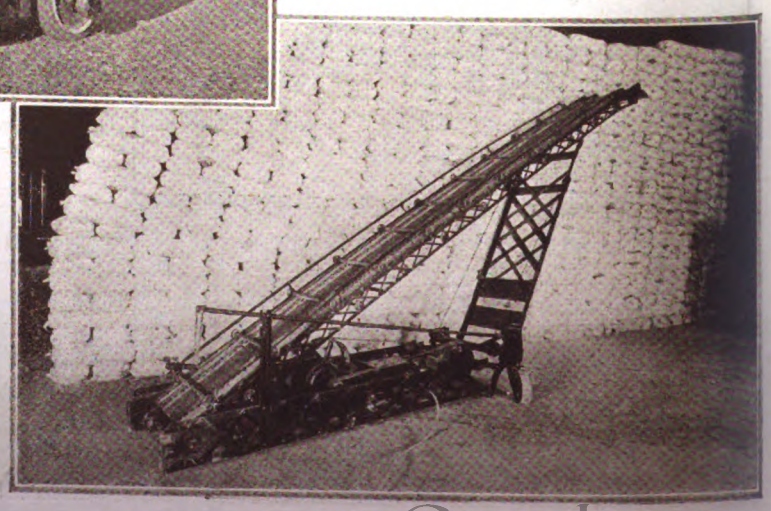


Below—Even for handling materials from dock to nearby warehouse, the hand-truck cannot compete, in speed and economy, with tractor and trailer.

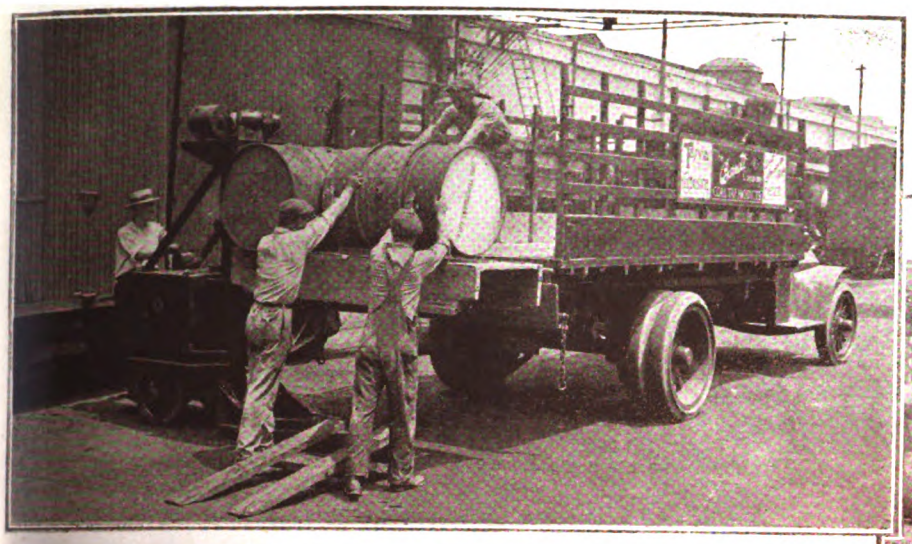
Below—another roustabout job that has been taken over by machines: the piling of bags, boxes and barrels inside the warehouse.

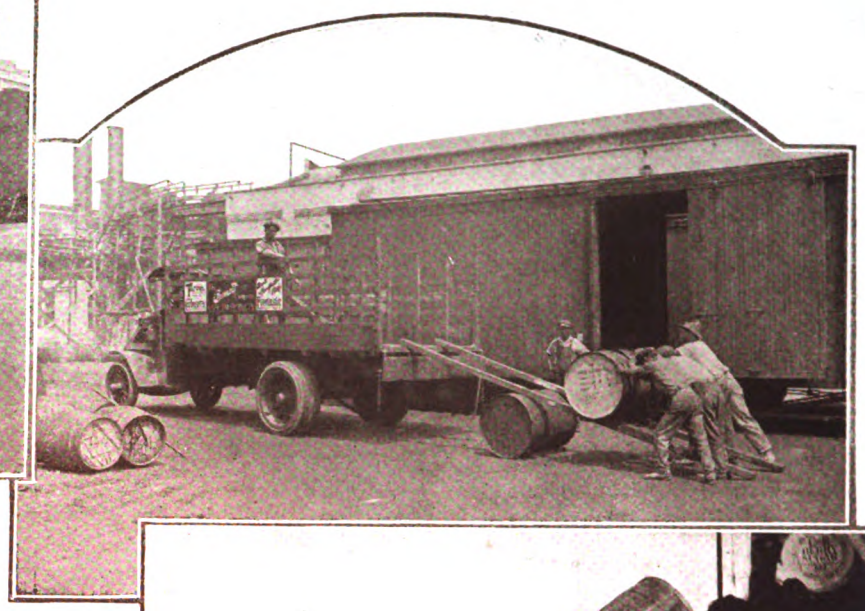


The stevedore of the future will be a man who can get the most out of his "iron slave," rather than one who can carry the greatest weight.



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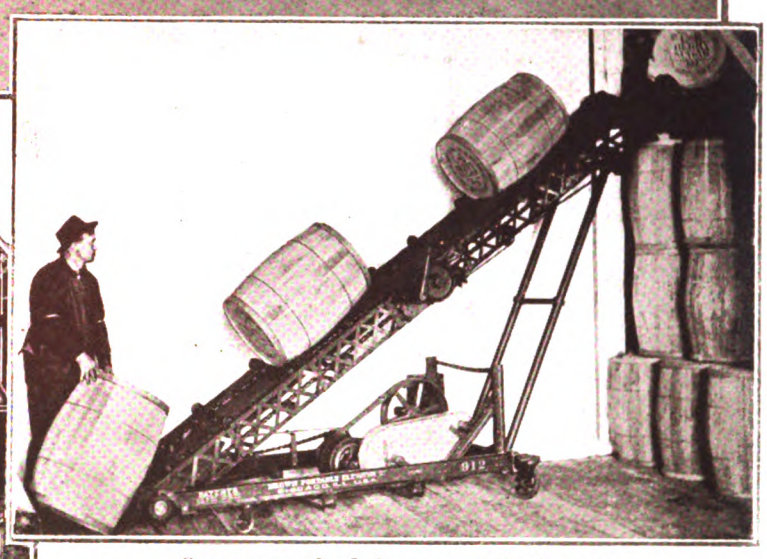


These two photographs might be called "Now—and Then." A large roofing manufacturer, in whose plant they were taken, would call them, from left to right, "Sense—and Nonsense;" indicating what he thinks of the electric lift truck on this job.

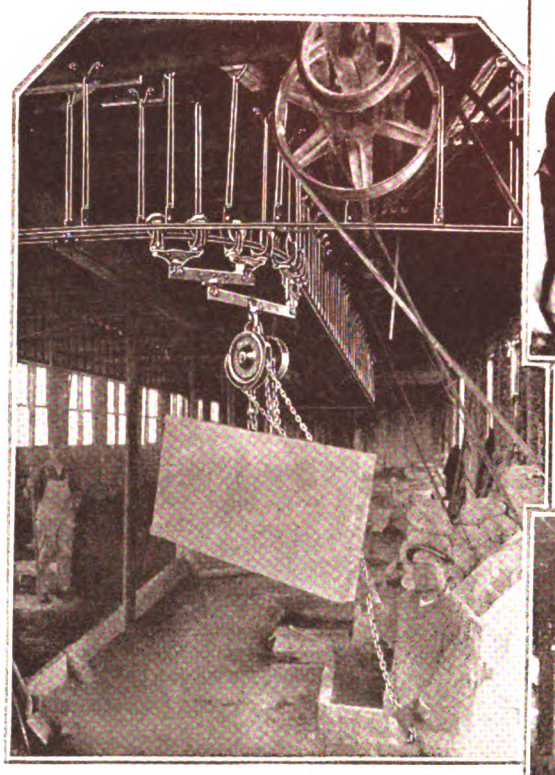
norance or inertia hamper the adoption of better methods. It is not that every hand-shovel, every wheel barrow, every hand-truck should be cast into the discard. That is not what the materials-handling engineer preaches. Nor does he argue that human brawn should be everywhere replaced by mechanical devices. But he does insist—and rightly so—that where human labor *can* be supplanted by mechanism resulting in better, faster handling at less cost (including fair return on the capital investment required) there is no excuse for failure to make the change.

As a concrete example of the accomplishments brought about by the "mechanical roustabout" in loading ships, we quote here from a recent article by Floyd W. Parsons in *World's Work*:

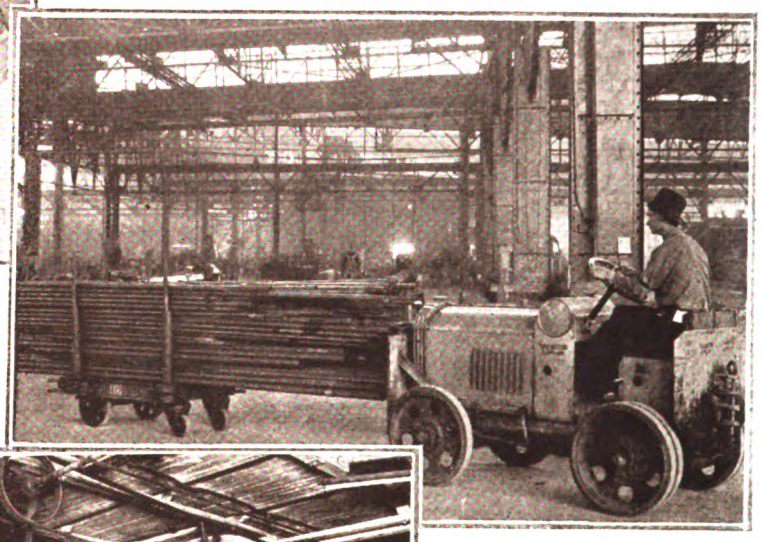
"The bulk of the domestic iron ore used in the United States is not touched by human hands from the time it leaves the mine until it is converted into such products as rails, structural shapes, wire rods, sheets,



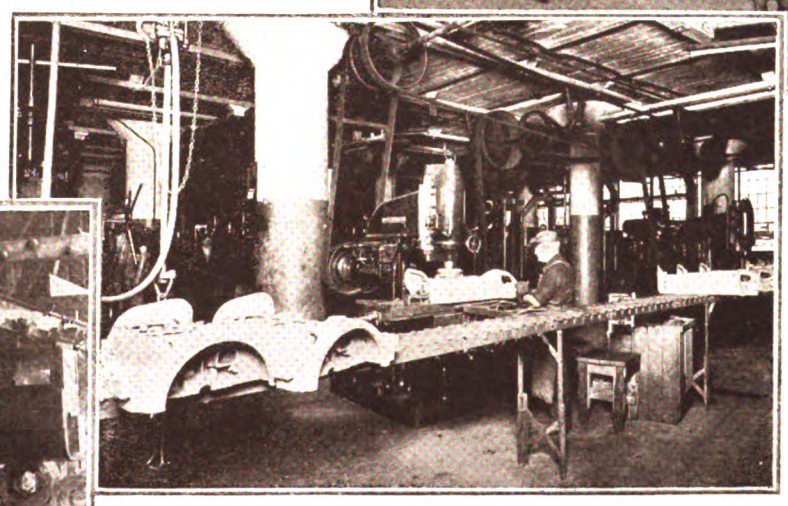
One man to lead them on at the bottom, one to guide them off at the top—and all the lifting and carrying is done by the machine. Human labor, on this job, would require six husky men.

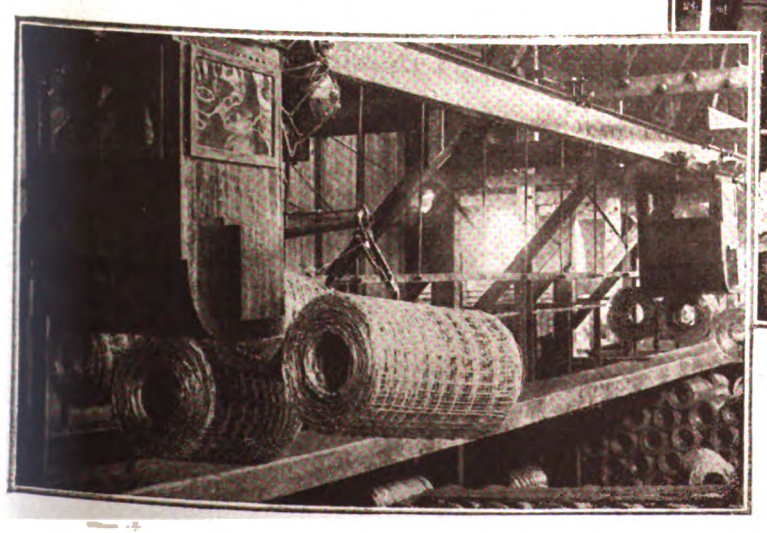


They used to jockey these slabs along by means of rollers, pinch-bars, and sweat. Before long, our industrial workers will have to play golf in order to get enough exercise.



Above—successor to the shop gang of huskies: the industrial tractor pushing a load of pipe. Formerly, two men carried half a dozen of these lengths per trip.





At the left—Rolls of wire fencing being stacked in the store-room by crane—a case where overhead reduces "overhead."

Keeping things moving, means more and cheaper production. In this case, gravity supplies the motive force.

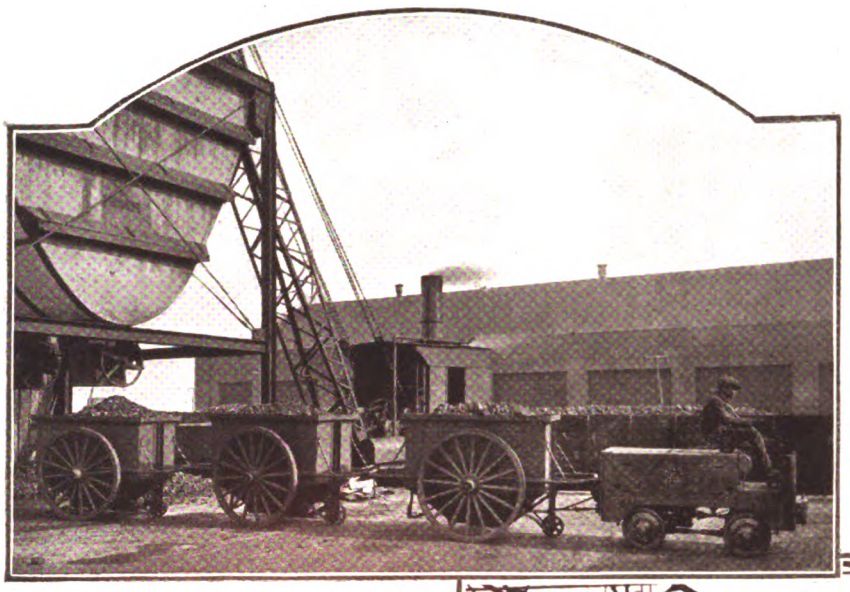
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bars, etc. The efficiency with which iron ore is handled at the docks on the Great Lakes is of such high degree that a steamer has been loaded, using little labor, with 10,111 gross tons of ore, in exactly 39 minutes. A cargo of this size can be unloaded in four or five hours, at a cost of about five cents a ton. It is mechanical developments of this kind that make it possible for American steel manufacturers paying high rates of wages to undersell competitors in foreign countries which produce steel with labor that receives a much smaller wage."

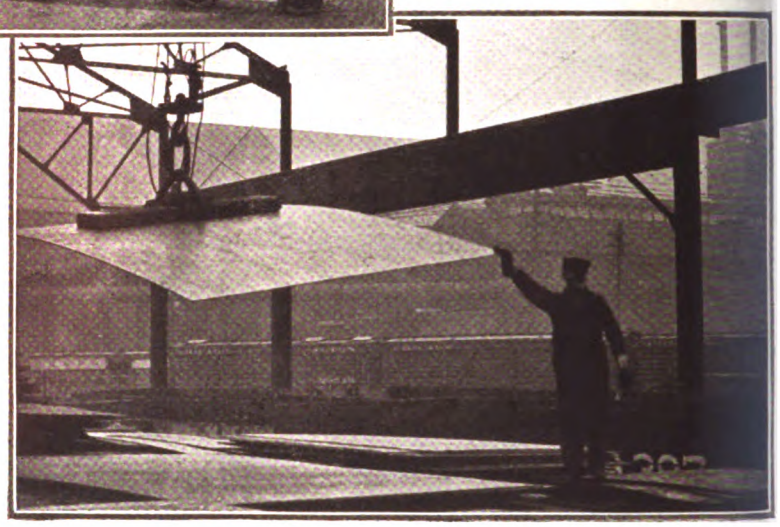
The same metamorphosis that is taking place on the waterfront today, in respect to the handling of materials, has made even greater strides in the industrial plant. A close examination of the accompanying illustrations cannot help but incline us to the view of the materials-handling engineer; that the marvel lies not in the accomplishment, but in the fact that there are still too many plants where the management either neglects or refuses to recognize the obvious. On each job pictured here, how many men would be required to do the same work; how much longer would it take them to do it; how would the resultant pay-roll compare with the cost of operating the equipment shown?

For example, consider the two photographs at the top of page 23—showing the new

(*Continued on Page 62*)



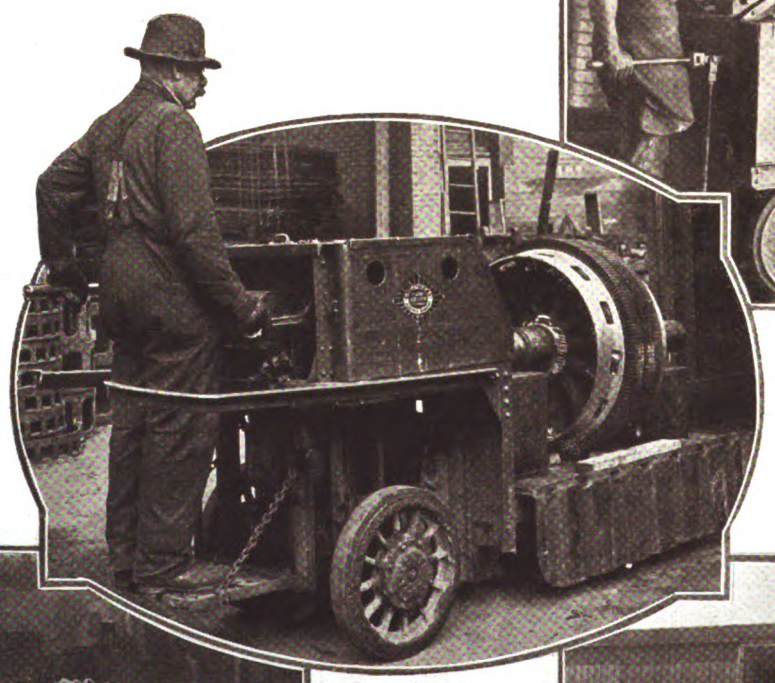
One man plus one electric tractor plus three trailers, equals thirty-six men plus thirty-six wheel-barrows—an arithmetic example that spells the doom of the wheel-barrow for work like this.



A good deal of the racket (and most of the sweating and swearing) has been taken out of the handling of steel plates by the electro-magnet.

Below—to use an army expression, the newer roustabout can "sit pretty"; with the hard work all taken over by machine. These rotors used to suffer from careless handling, but the platform truck "knows how."



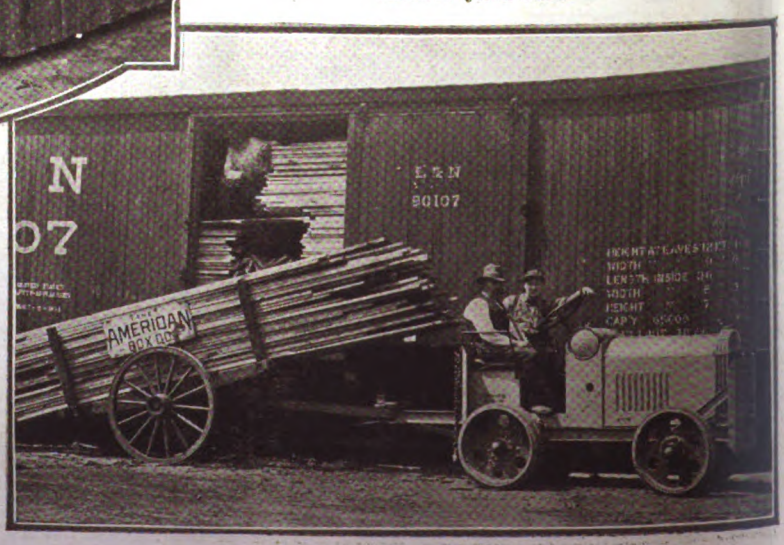


Above—an actual saving of ten dollars a day in the manufacturing of automobile fly-wheel results from the use of this platform-lift truck.

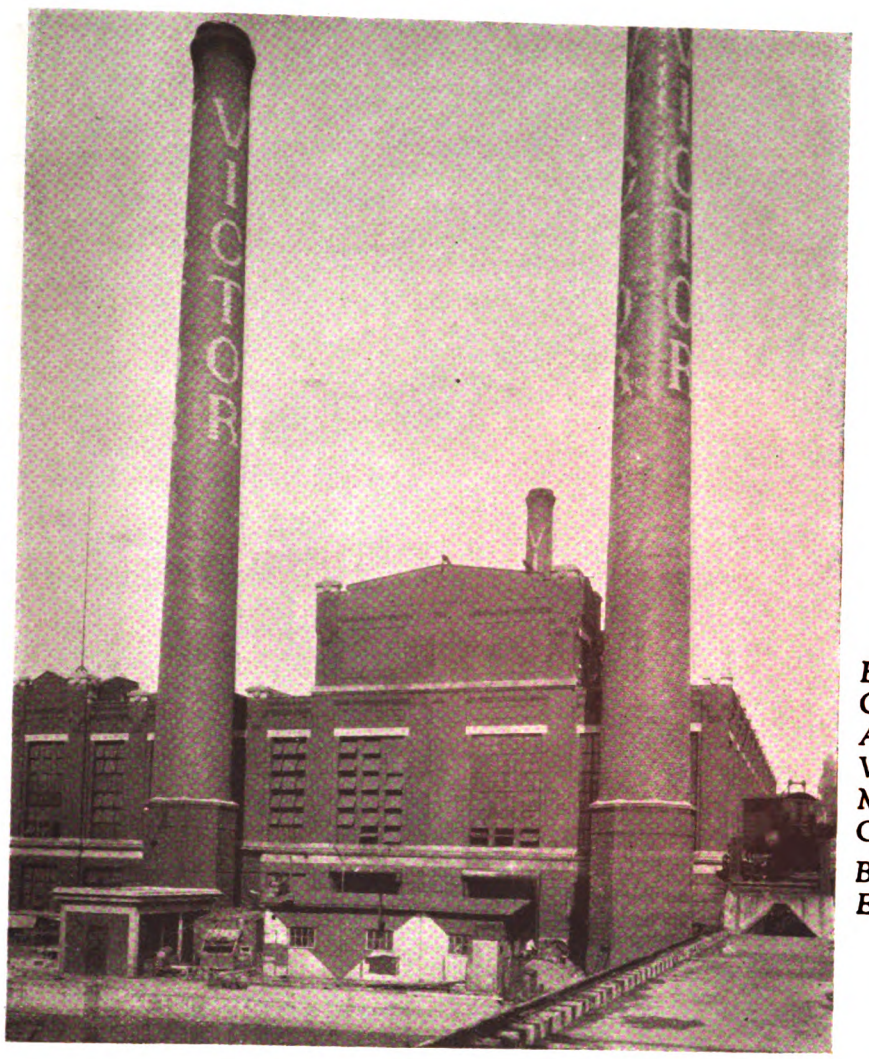
Below—a long draw-bar enables the versatile industrial tractor to handle lumber on the ordinary lumber-yard cart.

The "tote-boy" only does a part of the toting: the pulling part. The hand-lift-truck attends to the lifting.





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Brick, Steel and Concrete Power House Addition Victor Talking Machine Co., Camden, N.J.

Ballinger & Perrot, Engineers

—and the Victor Talking Machine Co. said: "Let WHITE build it of CONCRETE."

A quarter of a century of diversified experience in the building field, during which time we have served many of the foremost industrial corporations, qualifies "WHITE" not only to quickly execute contracts but to render you a service of the highest quality at a minimum of cost.

WHITE
CONSTRUCTION CO., INC.
95 MADISON AVE., NEW YORK, N.Y.

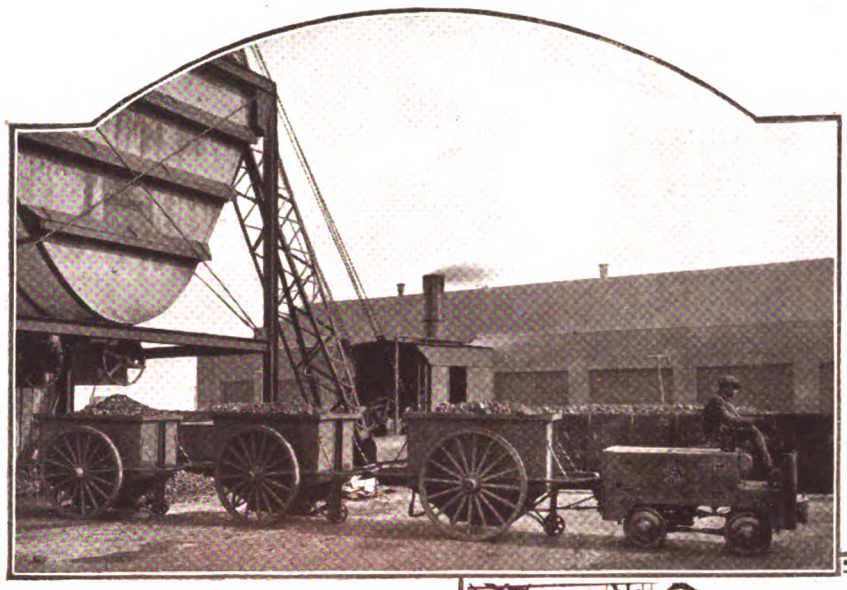
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bars, etc. The efficiency with which iron ore is handled at the docks on the Great Lakes is of such high degree that a steamer has been loaded, using little labor, with 10,111 gross tons of ore, in exactly 39 minutes. A cargo of this size can be unloaded in four or five hours, at a cost of about five cents a ton. It is mechanical developments of this kind that make it possible for American steel manufacturers paying high rates of wages to undersell competitors in foreign countries which produce steel with labor that receives a much smaller wage."

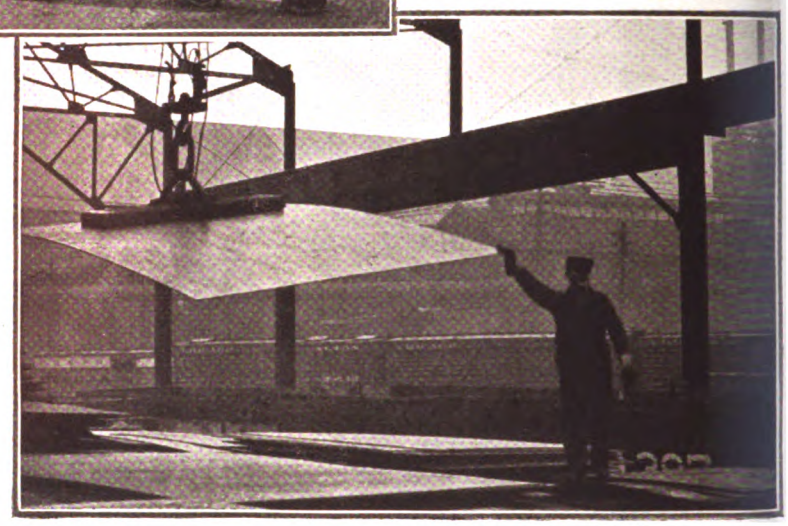
The same metamorphosis that is taking place on the waterfront today, in respect to the handling of materials, has made even greater strides in the industrial plant. A close examination of the accompanying illustrations cannot help but incline us to the view of the materials-handling engineer; that the marvel lies not in the accomplishment, but in the fact that there are still too many plants where the management either neglects or refuses to recognize the obvious. On each job pictured here, how many men would be required to do the same work; how much longer would it take them to do it; how would the resultant pay-roll compare with the cost of operating the equipment shown?

For example, consider the two photographs at the top of page 23—showing the new

(*Continued on Page 62*)



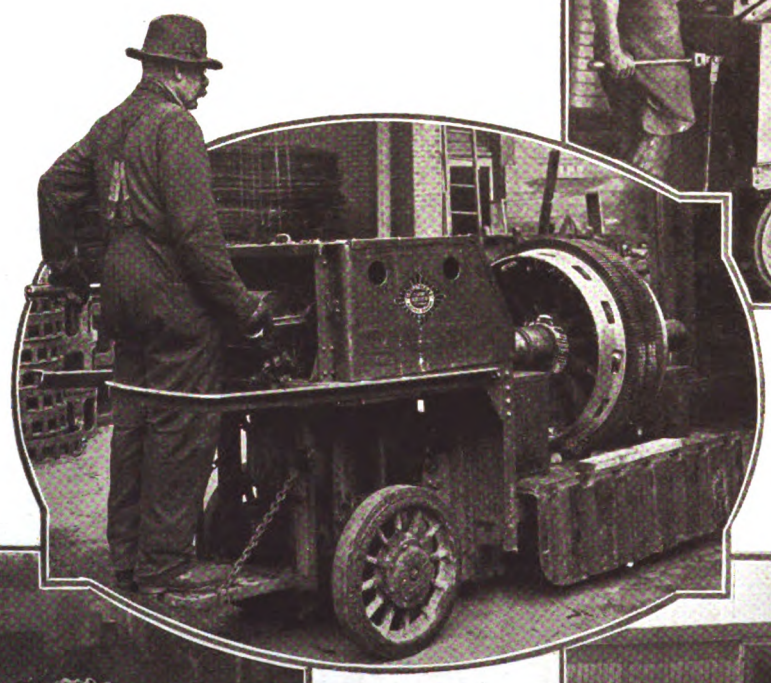
One man plus one electric tractor plus three trailers, equals thirty-six men plus thirty-six wheel-barrows—an arithmetic example that spells the doom of the wheel-barrow for work like this.



A good deal of the racket (and most of the sweating and swearing) has been taken out of the handling of steel plates by the electro-magnet.



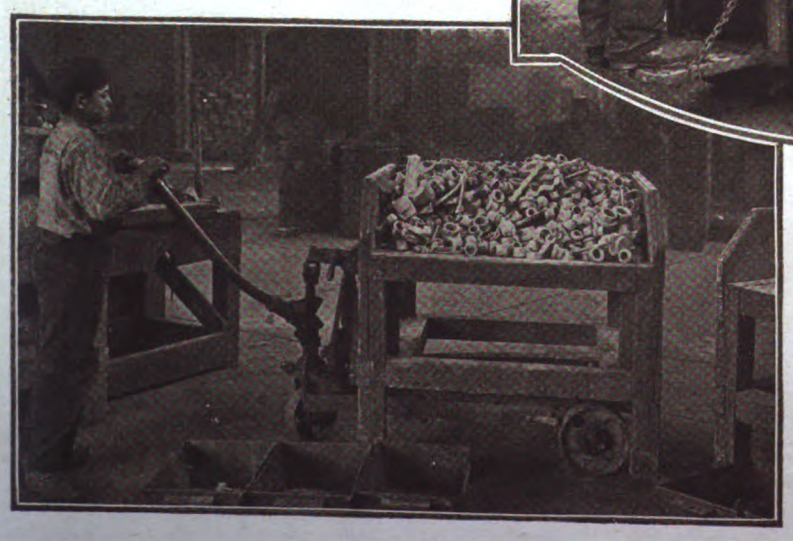
Below—to use an army expression, the newer roustabout can "sit pretty"; with the hard work all taken over by machine. These rotors used to suffer from careless handling, but the platform truck "knows how."

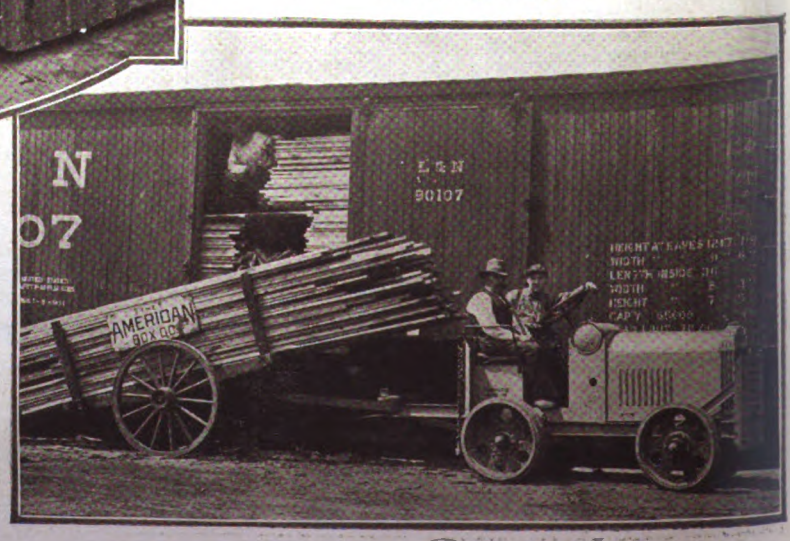


Above—an actual saving of ten dollars a day in the manufacturing of automobile fly-wheel results from the use of this platform-lift truck.

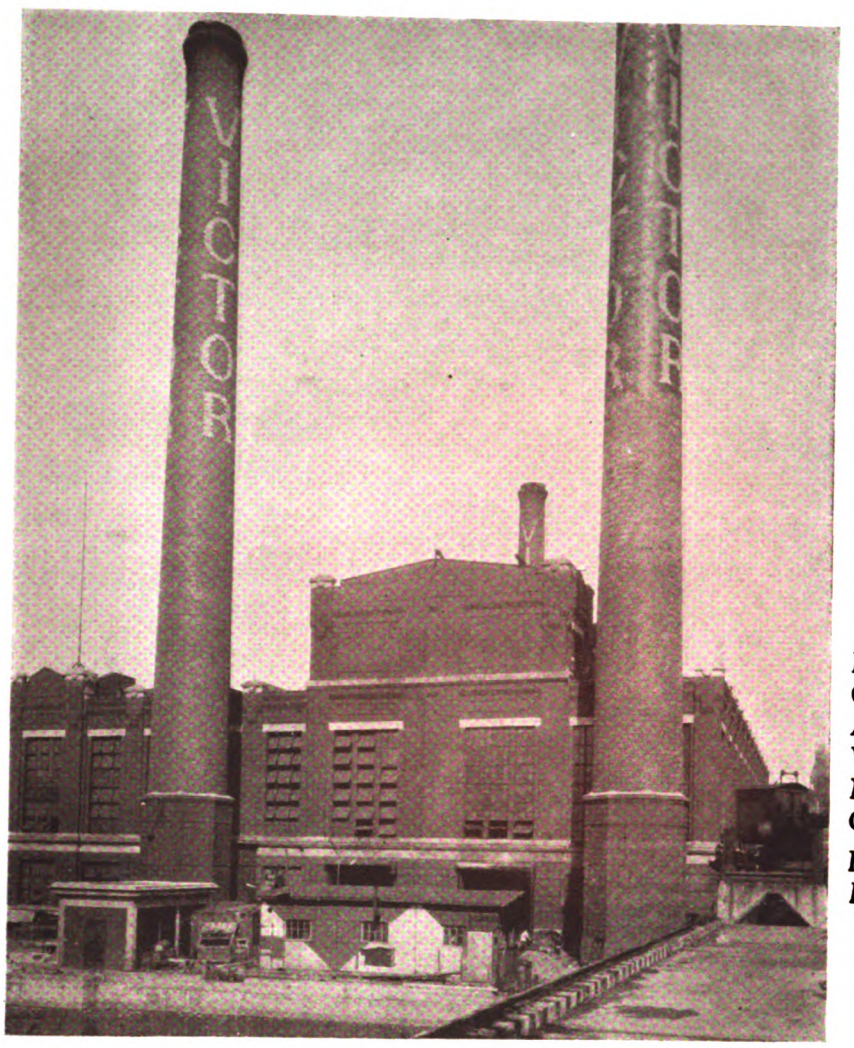
Below—a long draw-bar enables the versatile industrial tractor to handle lumber on the ordinary lumber-yard cart.

The "tote-boy" only does a part of the toting: the pulling part. The hand-lift-truck attends to the lifting.





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Brick, Steel and Concrete Power House Addition Victor Talking Machine Co., Camden, N.J.

Ballinger & Perrot, Engineers

—and the Victor Talking Machine Co. said: "Let WHITE build it of CONCRETE."

A quarter of a century of diversified experience in the building field, during which time we have served many of the foremost industrial corporations, qualifies "WHITE" not only to quickly execute contracts but to render you a service of the highest quality at a minimum of cost.

WHITE
CONSTRUCTION CO., INC.
95 MADISON AVE., NEW YORK, N.Y.

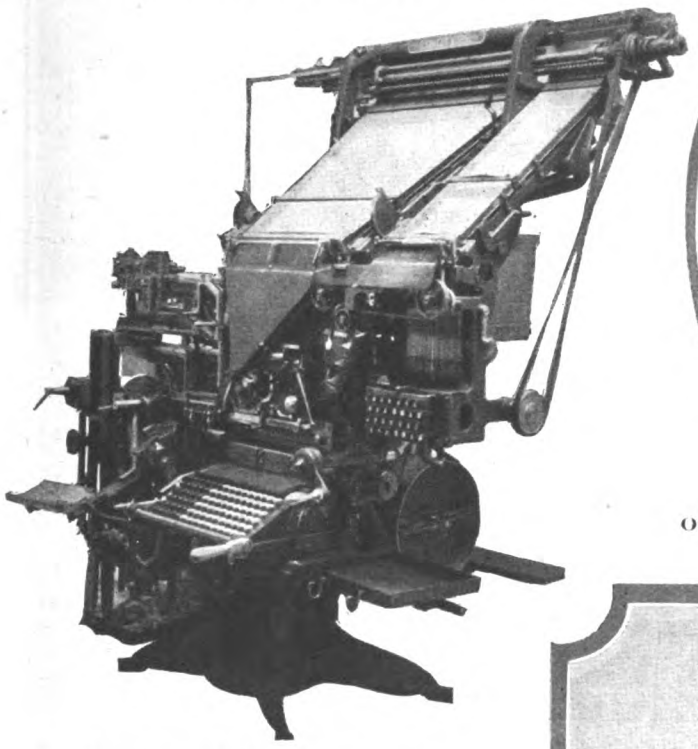
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Do You Know "How It Works"?

The Linotype---Masterpiece of Inventive Ingenuity

BEFORE describing how the Linotype works, suppose we first jog our memories a bit and consider what this composing machine is called upon to accomplish. To do this we must first sketchily trace the history of printing for a better understanding of the successive steps that led up to the need for such a machine.

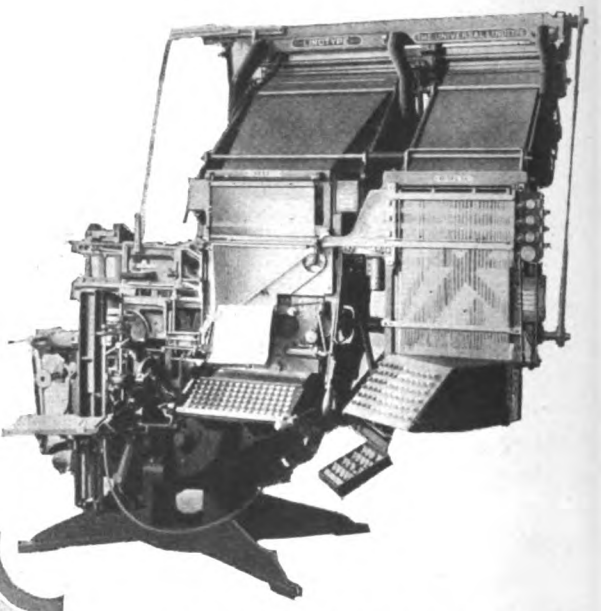
As late as the second half of the Fourteenth Century, in Europe, all books, public and private documents, even playing cards—were produced by pen and brush. In the early part of the Fifteenth Century, printing from engraved wood-blocks came into extensive use; this method of producing copies being a vast improvement over the laborious one of copying by pen and brush. There still is a dispute as to just when and by whom the idea of printing from movable, individual type was conceived. Without going into



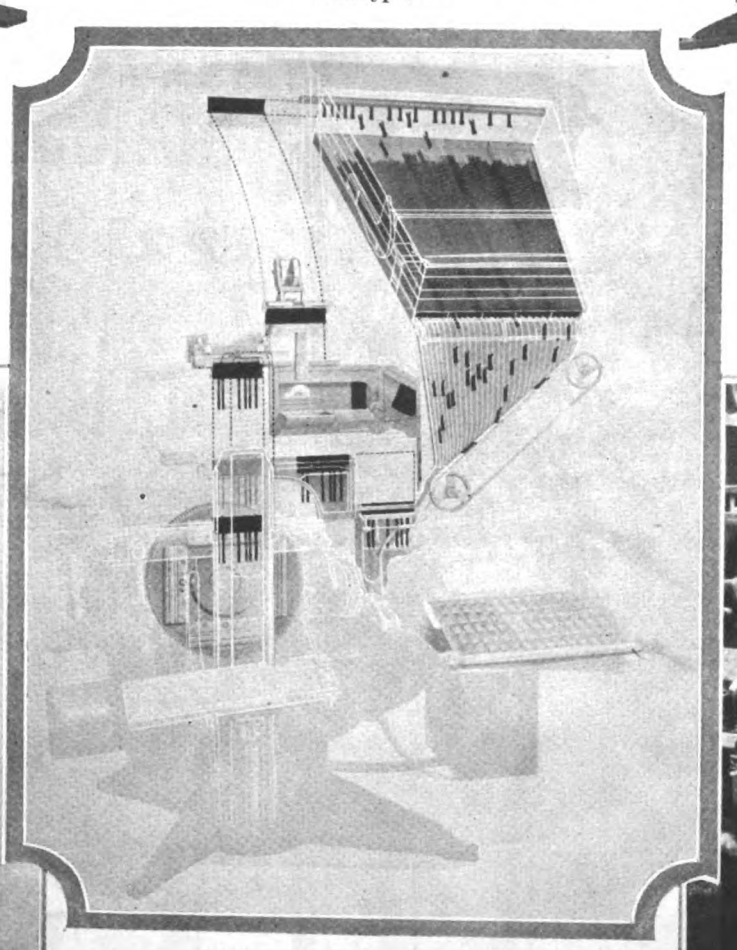
On this machine, four different sizes, seven different faces of type, are at the command of the operator. This model is in extensive use.



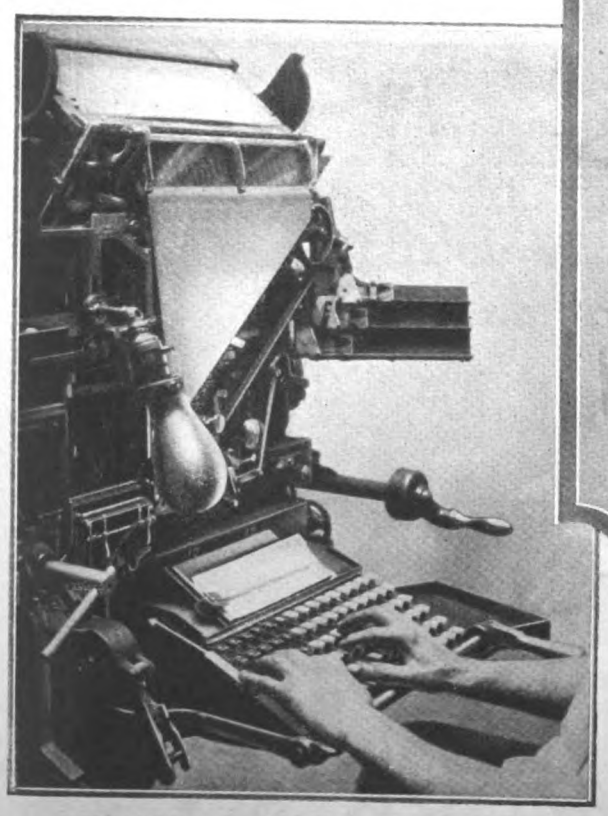
Ottmar Mergenthaler, inventor of the linotype.



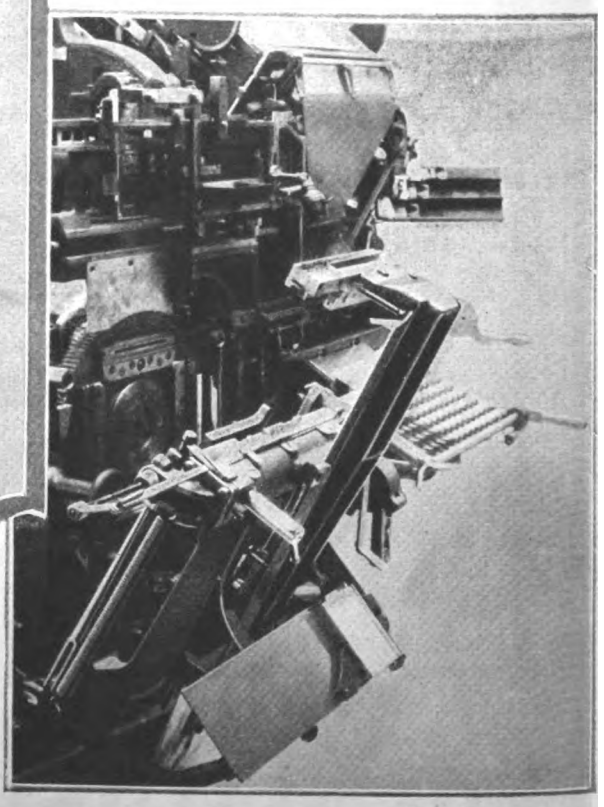
The latest thing in composing machines, which makes possible virtually all combinations of characters, from the smallest type up to type ½ inch high.



A phantom view of a three-magazine linotype, showing the progress of an imaginary line through the stages of assembling, casting, and return and proper distribution of matrices (see text).



The linotype keyboard is similar to a typewriter keyboard with a key for each character. Depressing the key causes a corresponding matrix to drop into place in the assembling line.



Three-magazine linotype, with the first elevator lowered, showing the mold disk, and a cast slug being ejected from one of the molds.

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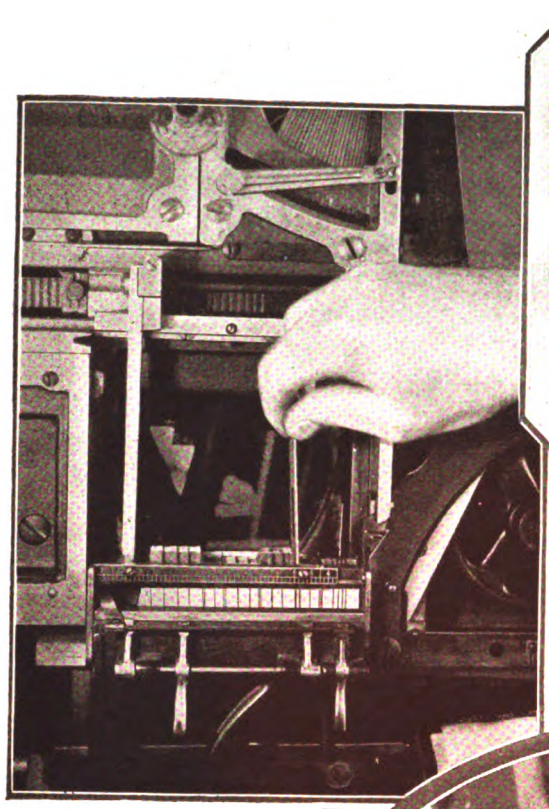
the details of this dispute, it is enough to know that printing from movable type made its appearance about the middle of the Fifteenth century.

Various developments and improvements took place in methods of *producing* the types, but there seems to have been no attempt to better the hand-method of composing (assembling the individual characters to form words and lines) until about the year 1822. It must be remembered that by the hand-method the individual characters are picked out of the type-case compartments and assembled in lines, the requisite number of lines for a page being then assembled together for printing. This constitutes what is known as composition.

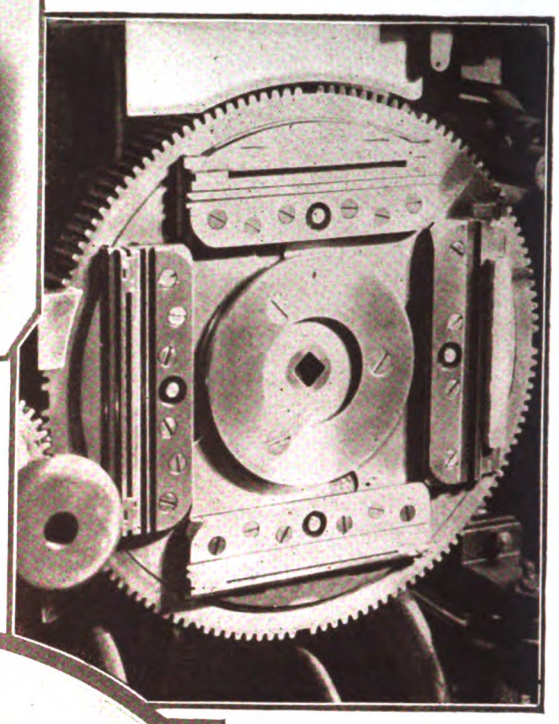
After printing, the individual type characters must be replaced in their respective compartments of the type-case for future use. This is known as distribution. As machine methods of type-casting progressed, it was found cheaper to re-melt the type after printing—rather than to re-distribute it—and to cast new type characters.

The Linotype Composing Machine which was first put to commercial use in the composing room of the *New York Tribune* in July, 1886, is based on the idea of casting an entire line of type as a unit. The entire line, or Linotype slug, is formed by bringing together such matrices and spacebands as are required for a line and then maintaining the assembled elements in casting position while molten metal is pumped into a mold and against the face of the assembled line. The machine then completes a revolution, and the Linotype slug is pushed out ready for printing. Fifty or more slugs can be lifted by hand at one time, and the slugs can be moved about from place to place without danger of "pi-ing." Individual characters cannot fall out, nor can they work up in a form on the press. And when slugs have been used once, they can be returned to the melting pot.

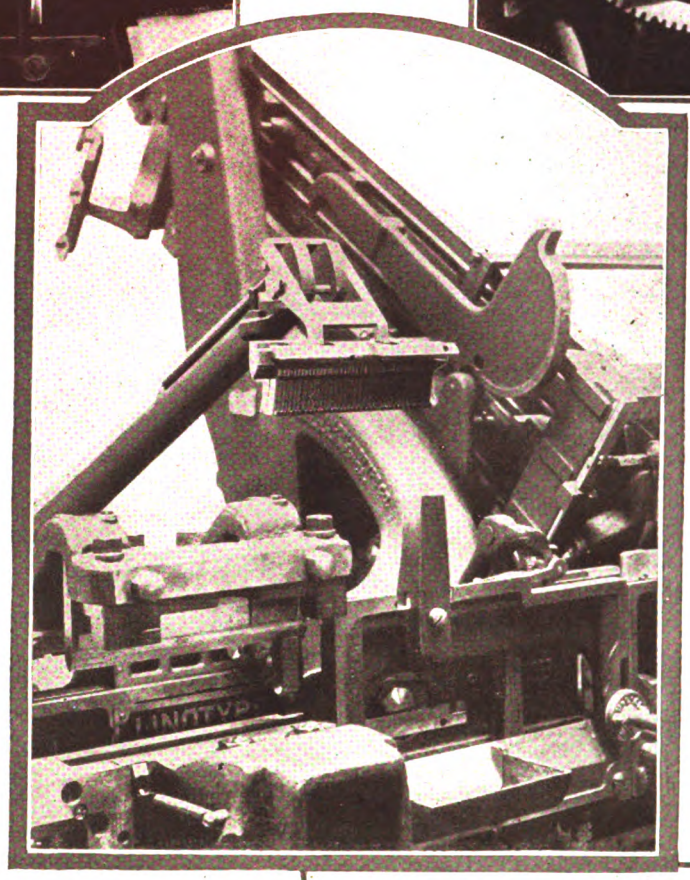
Linotype metal is a mechanical mixture of lead, tin and antimony. Lead is used as the body because of its low melting point. Tin produces



An assembled line of matrices and spacebands. The latter are the long, projecting pieces. See text for detailed description.

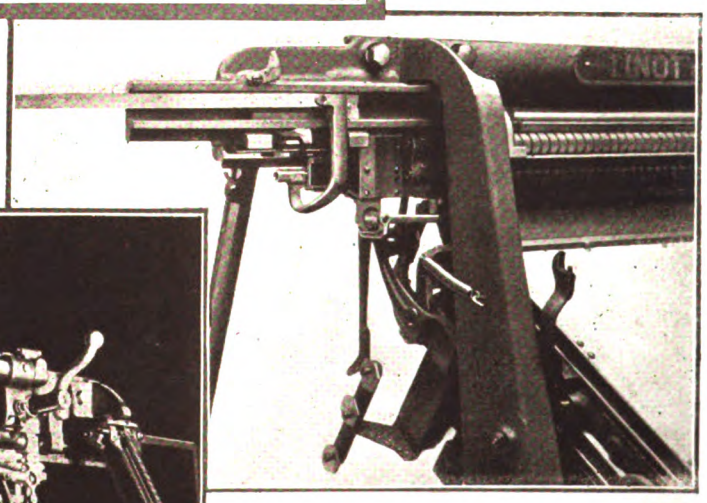


When it is desired to transpose matrices or spacebands in the assembled line before casting, the thing can be easily and quickly done by hand — as shown above.

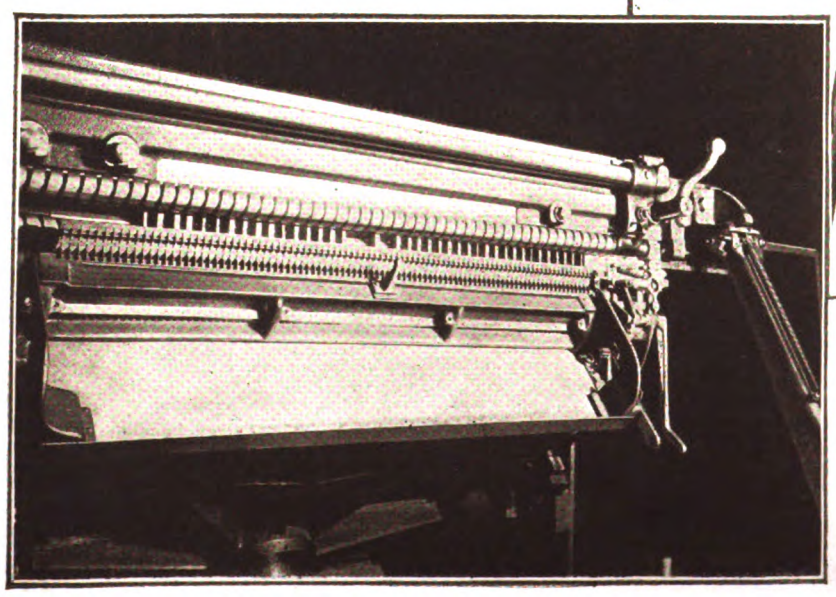


Above—a close-up of the water-cooled mold disk. Any one of the four molds can be brought instantly to operative position by turning the knob on the left.

Center—The matrices are here being lifted (after casting a line) to the distributor, automatically; the spacebands automatically returning to the spaceband box.

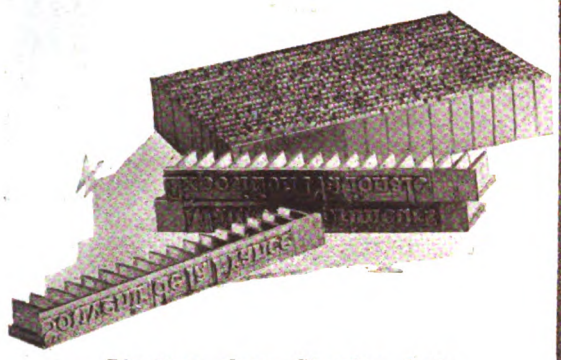


Above—The matrices have been lifted and are here being pushed into the distributor.

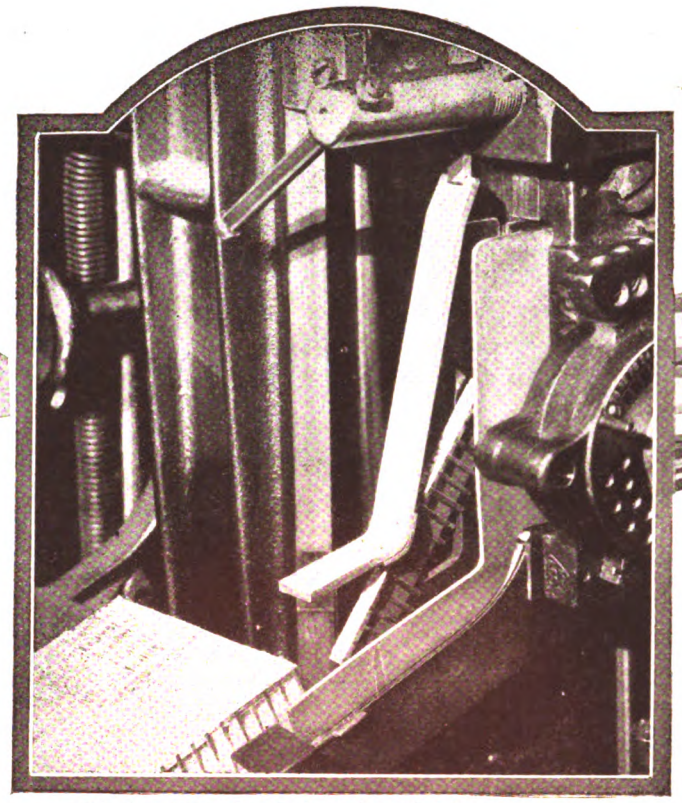


At the left—The distributor. When a matrix travels along the "combination bar," it automatically drops when it reaches its proper place, as explained in the accompanying text.

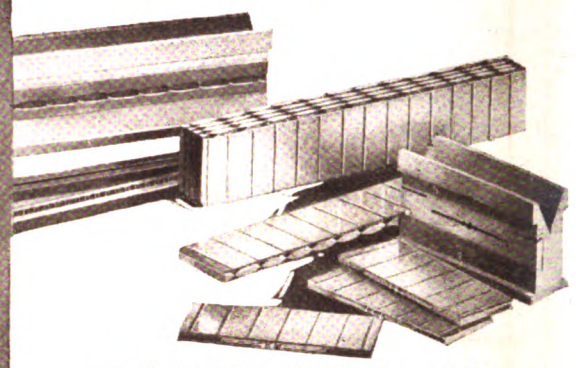
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Linotype slugs—Showing both "straight," or small type, and display type lines cast on the same machine.



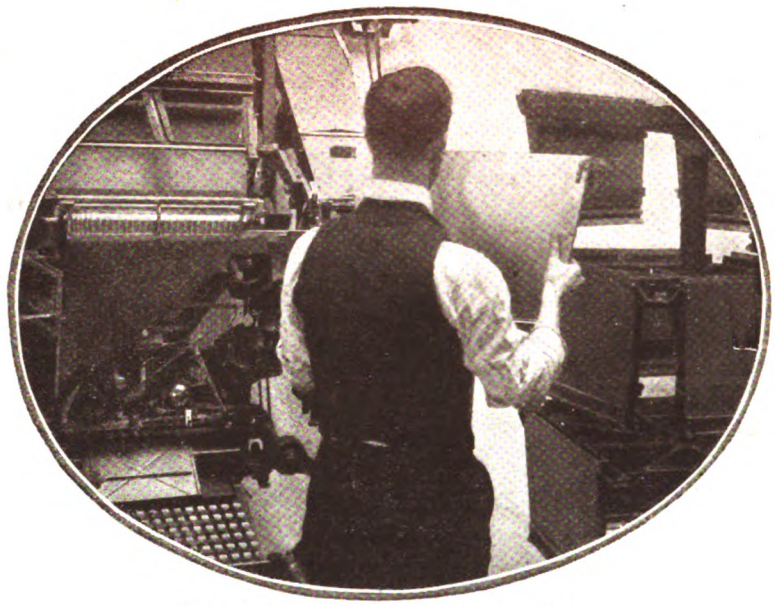
Display-type slug being ejected from the mold after casting. Knives trim it to exact size, and it takes its proper place on the galley.



Typical matrix slide-blocks and the slugs they produce. These matrices are inserted by hand, for producing borders, etc.

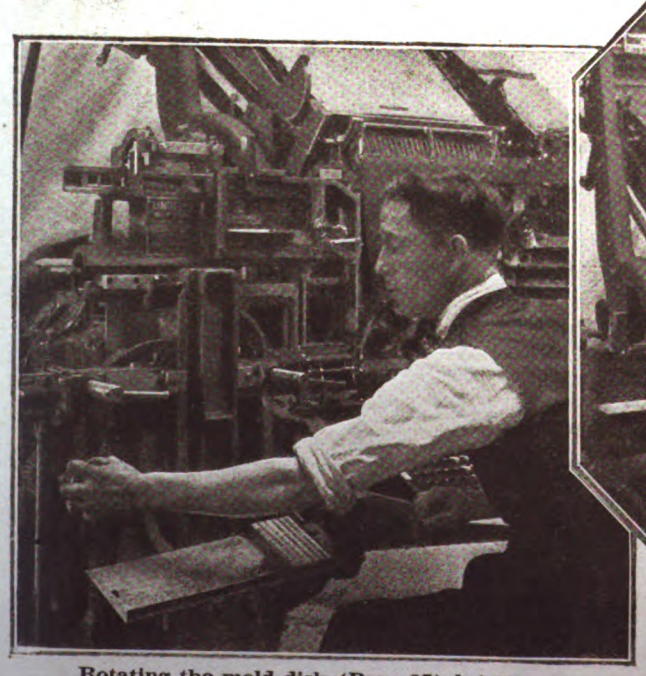
toughness, permits the metal to flow more smoothly and freely, and also serves to unite the other two metals. Antimony produces the required hardness.

Most of the matrices used in the Linotype are flat pieces of brass about three-quarters of an inch in width by about an inch and one-quarter in length, and each of them, with the exception of some of the space matrices, has the reverse of one or more type characters stamped, or punched, in one edge. Each of the matrices designed to run in a magazine or to run as sorts (that is, to run to a point of rest outside of a magazine, and to the right of the main keyboard) has a certain combination of notches, or teeth cut in the top of it. These teeth, aside from making possible the suspending of the matrices from various "combination bars," are important factors in the determining of the respective courses to be followed by the respective matrices while in circulation on a machine. In addition to these upper notches, most of the matrices carry at the bottom one or more "font notches," which are important factors in determining whether certain matrices shall be distributed with other matrices. Some Linotype matrices are made without upper notches, and so are not lifted to the top of the machine when the elements of an assembled line in which such matrices have been used are being distributed, but drop into a tray within reach of the operator while seated at the machine. Some of the thinner space matrices are made of steel.

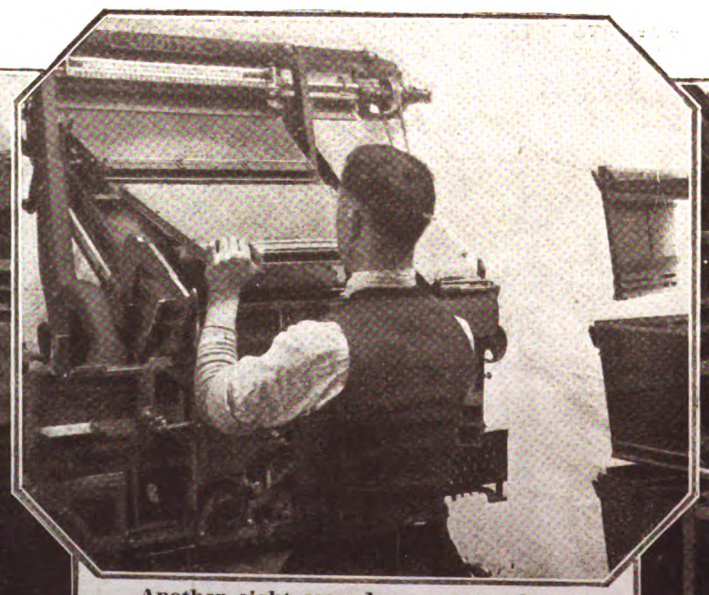


This, and the three photos below, show the steps in changing magazines on the linotype. Eight seconds suffices to remove the magazine.

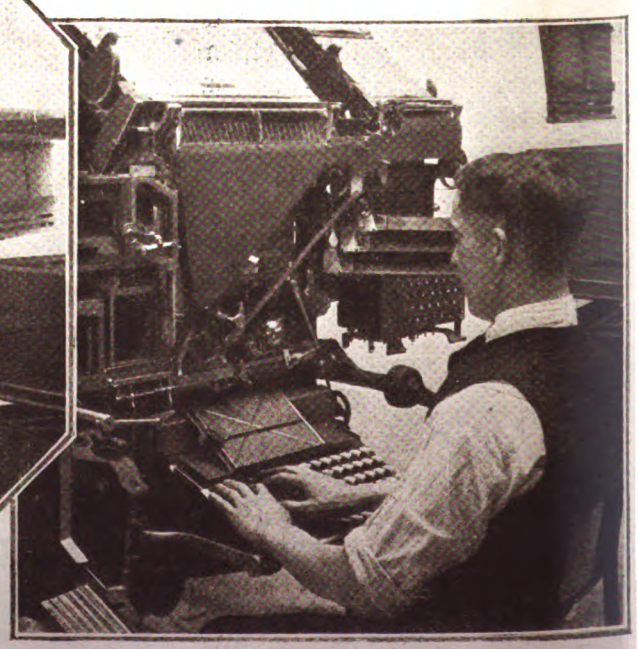
(Continued on Page 61)



Rotating the mold-disk (Page 27) brings the desired body-size into position.



Another eight seconds serves to place a new magazine—with different face or size—in place on the machine.



In less than half a minute the operator is setting type of a different style.

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When measured by this

Yardstick

How does your Advertising size up?

ONE of the difficulties about measuring the worth of advertising has been the lack of the tools of measurement.

Just as it would be difficult to measure a yard of cloth without some sort of rule or tape, it is difficult to measure the value of advertising without some kind of yardstick.

We have undertaken to provide this in "A Yardstick for measuring the Worth of Your Advertising."

This "Yardstick" is simply a clear statement of the four essentials with which good advertising should conform, plus a few words intended to help measure any particular piece of advertising by these standards.

We shall gladly send you a copy of the "Yardstick," if you will write us on your business stationery.

Send for a copy of the "Yardstick"

WALES ADVERTISING CO.

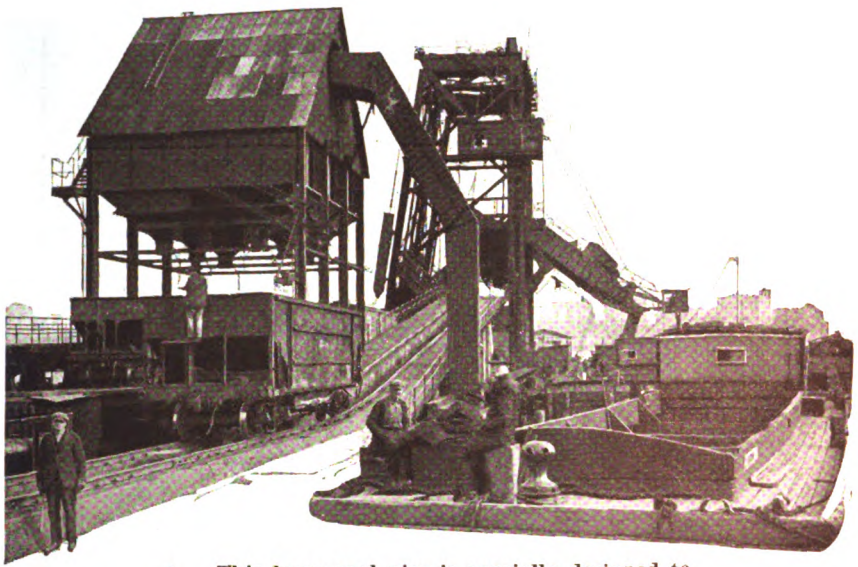
141 West 36th Street, New York

JAMES ALBERT WALES H. M. KIESEWETTER FREDERICK JORDON WM. RICH CROSS

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Outgeneraling Old King Coal

Modern Machinery that Circumvents Rising Fuel Costs



This huge coal pier is specially designed to handle coal with minimum delay and labor, direct from cars to ship or lighter. A large part of New York's coal comes through here.

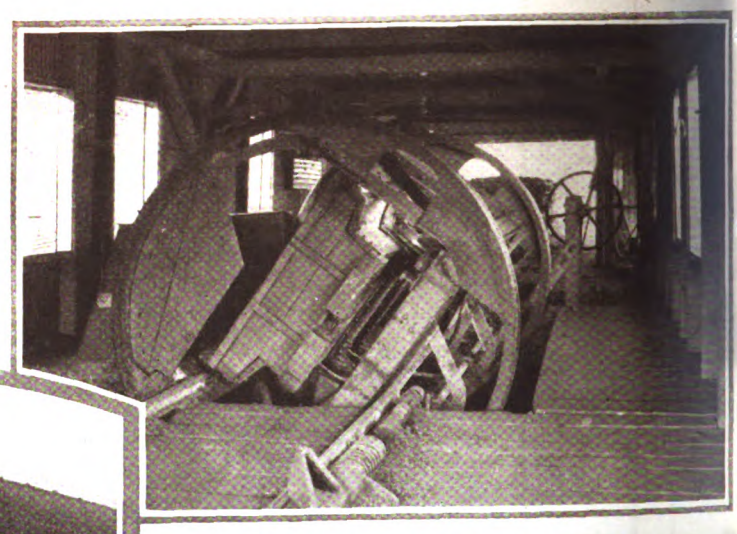
ONE can hardly pick up a newspaper or a general magazine nowadays without finding, somewhere in its pages, a discussion of the "Coal Situation." The miner claims he doesn't get a living wage; the operator insists that he is getting less profit than he did before the war; the railroads pass the buck for high coal freight rates to Uncle Sam; the retailer says he has shaved his former profit, and that the trouble lies at the producing end. Whereupon, we are confronted with advertisements by each of these interests hammering home by facts and figures its own guiltlessness.

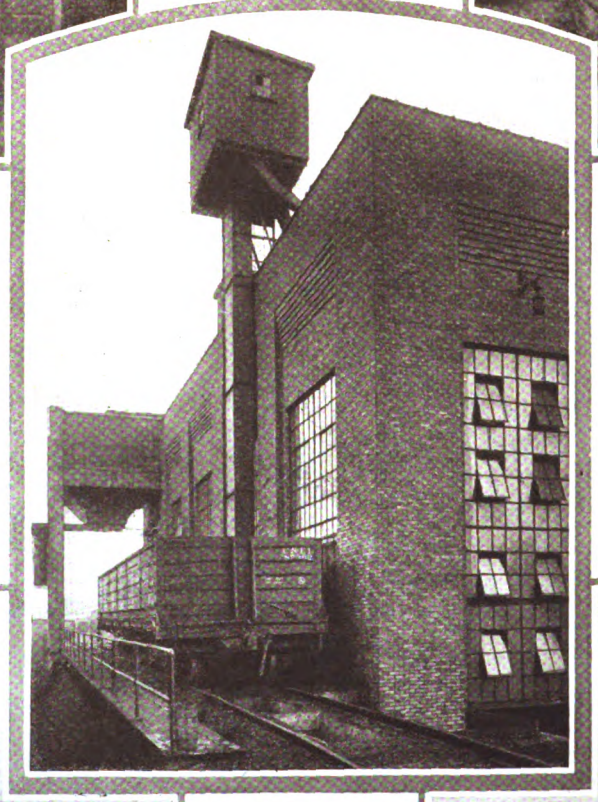
The consumer is the only interested party who is not doing any advertising. The only facts and figures that interest him are: the fact that he must have coal, and the figure he must pay to get it. He reads the various statements and arguments and conclusions and predictions, and notes that they seem to have little effect on the actual price of coal.



This type of grab-bucket is specially designed to scoop to every part of the coal-carrying lighter, thus minimizing the hand-shoveling involved in transferring the coal to destination.

Below — A thoroughly up-to-date installation in a manufacturing plant; coal elevator in the foreground, ash hopper in background.



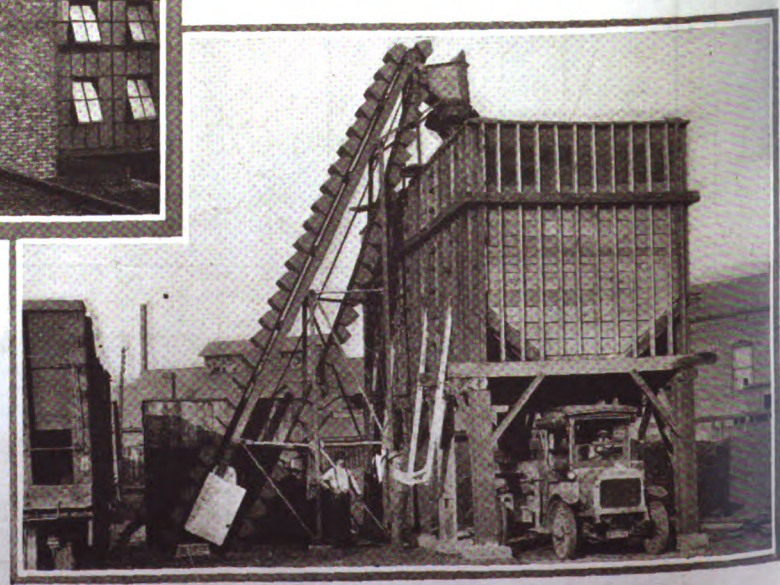


This rotary dump handles four cars per minute, turning them over to empty the coal. Each car carries two and one-half tons. A similar arrangement for standard coal cars is under consideration.

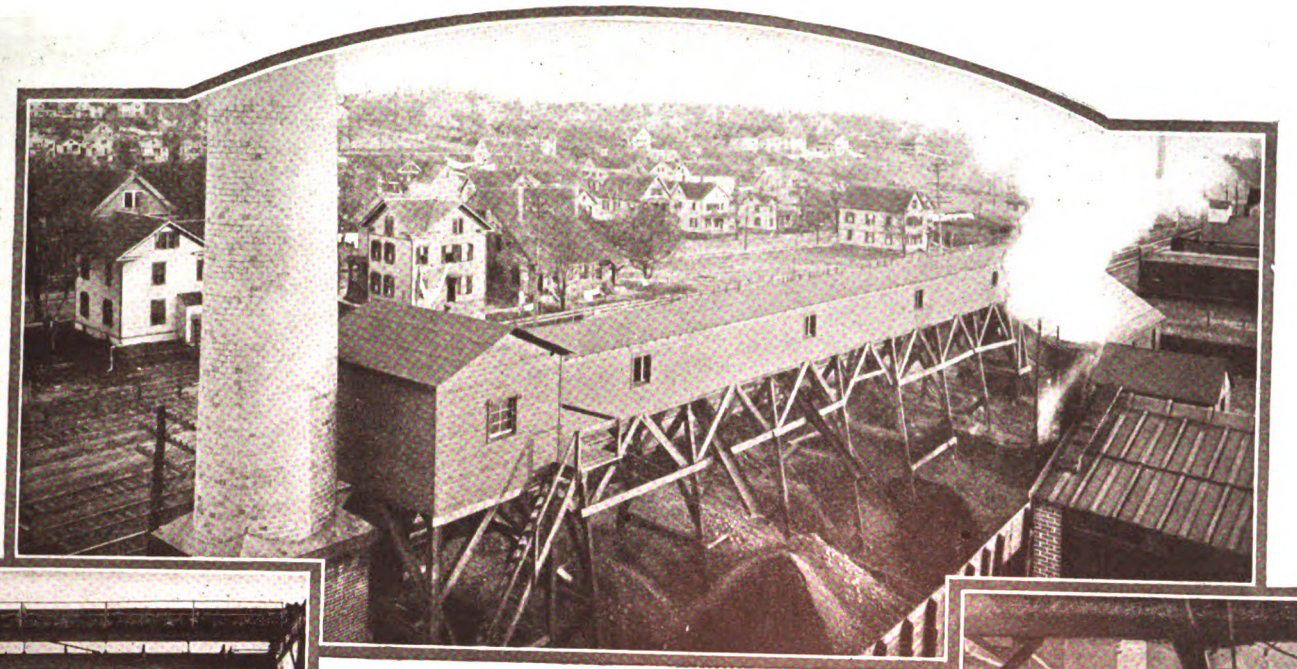
Below—The portable loader has many uses. In this case, it is piling coal from the car to a safe distance back from the track.



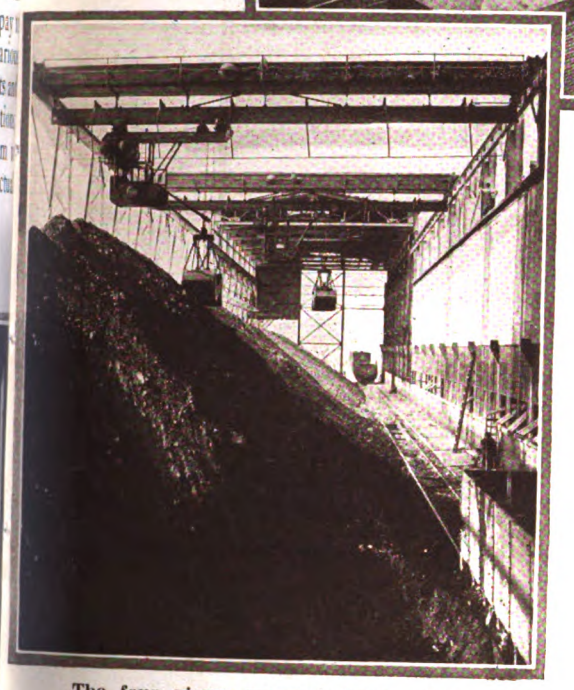
Below—Coal is dumped through the car-bottom, into a pit; the bucket elevator carries it to overhead hopper, with weighing-platform beneath, where trucks are loaded.



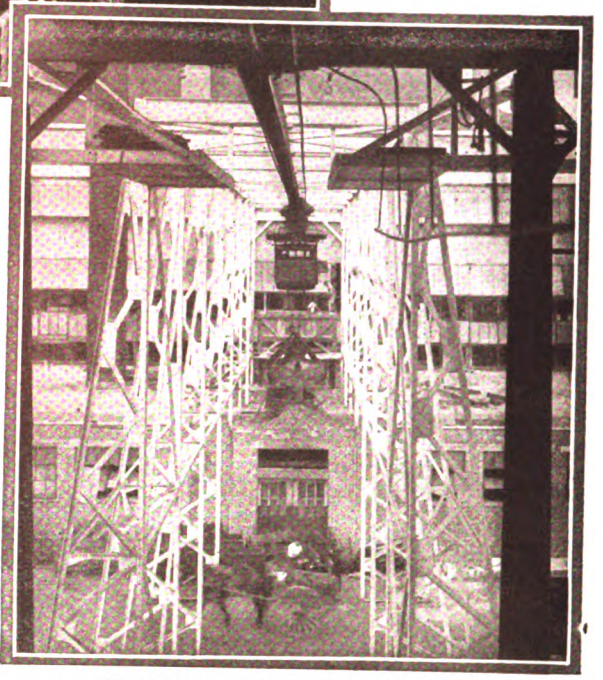
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Part of a coal storage and handling system in a large manufacturing plant. Machinery picks up the coal, conveys it to hoppers, delivers to mechanical stokers; and machinery picks up the ashes and conveys them to cars for removal.



The four views grouped here, show various details of the overhead trolley method of handling coal in a large manufacturing plant—



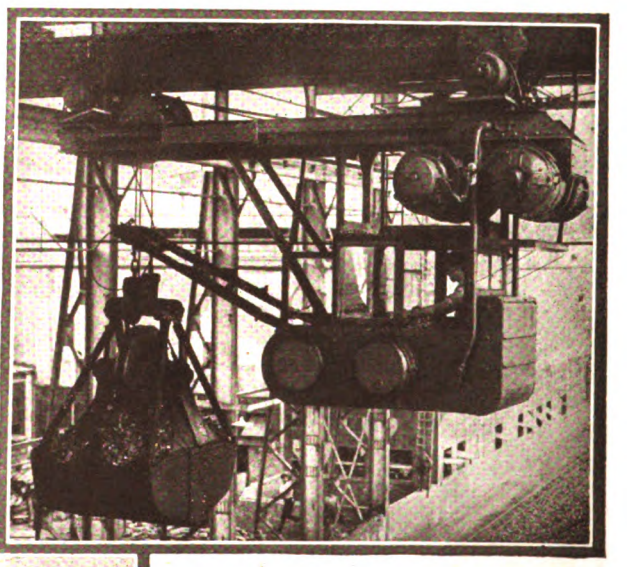
—Coal can be stored at a distance, and in enormous quantities; the overhead trolley system running to all parts of the plant where coal is used.

Ultimately, perhaps, all this discussion and investigation will bear some fruit. Ultimately we may discover why coal prices are high; and if unreasonably high, how to bring them down. But meanwhile, wouldn't it be better for the consumer to give a thought to the consuming end of the problem? Irrespective of whether coal prices, freight rates, dealer profits, are too high, what about the preventable waste of coal by the consumer, and especially the industrial consumer?

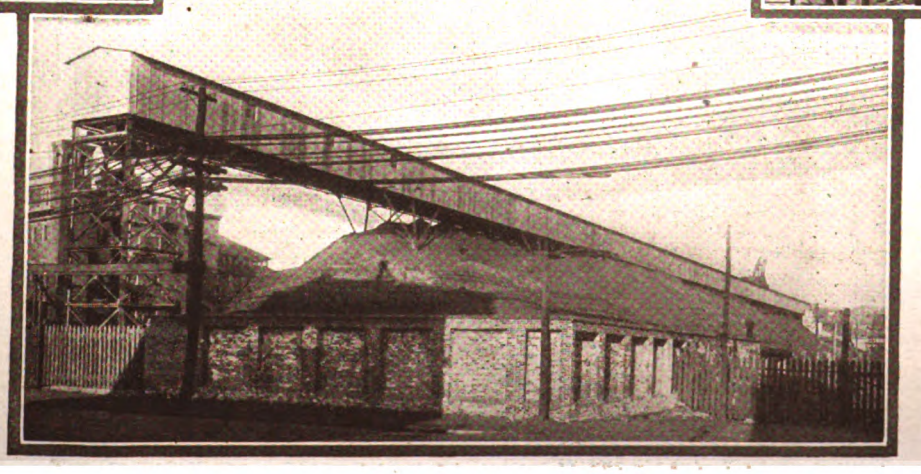
First of all, when your coal is delivered what facilities have you for getting it off the cars, so that the latter are released in the shortest possible time? Because each car unnecessarily held means that much reduced haulage capacity by the railroads.

Having taken coal from the cars, do you put it "any old place" until you need it, or do



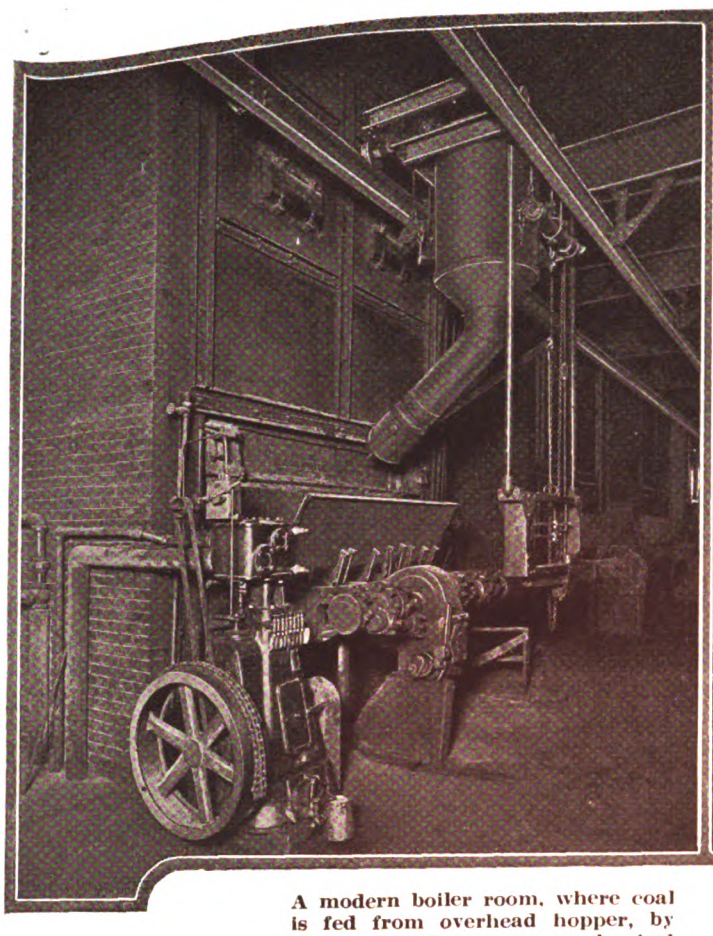


Another view of the type of coal-handling equipment shown at the top of this page, giving an idea of the immense amount of coal stored—

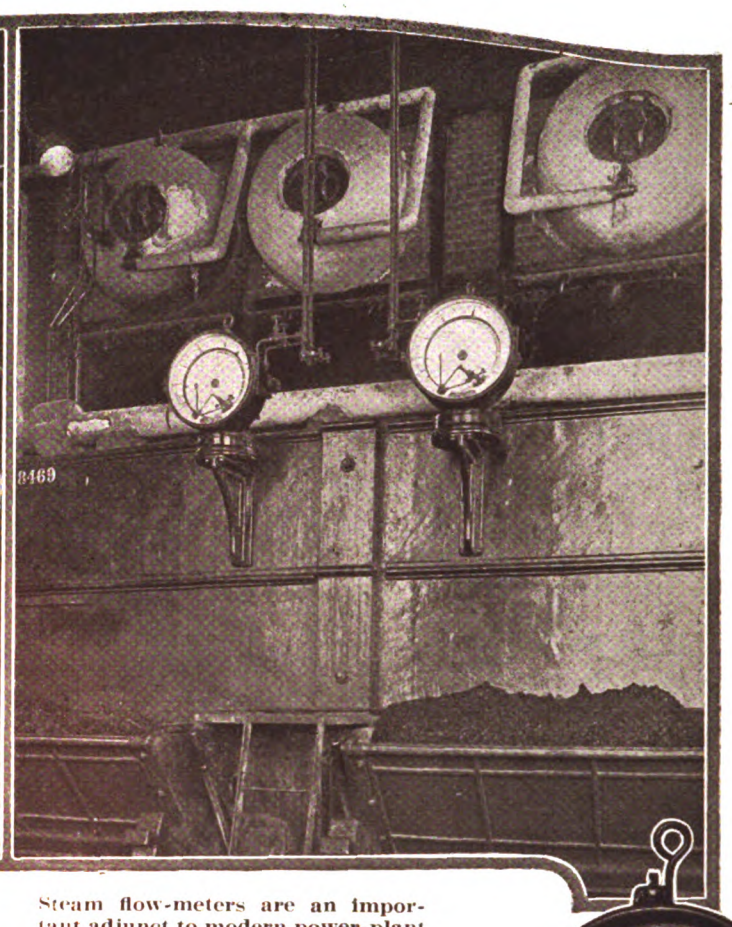


—Obviously expensive to install, yet such equipment as this, saves an immense amount of money by its comparative speed and economy of operation over older methods.

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A modern boiler room, where coal is fed from overhead hopper, by a weighing-larry, to mechanical stokers.



Steam flow-meters are an important adjunct to modern power-plant apparatus. (See close-up, below.)

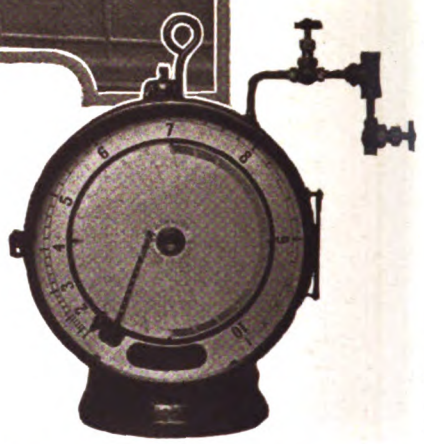


By recording the percentage of carbon dioxide in flue gases, the engineer can check up on combustion conditions.

you store it in such a manner that its travel from railroad (or from barge, as the case may be) to boilers involves the very minimum of labor and expense? When coal was cheap, this factor didn't assume such importance as it does today. But each pound of coal lost through careless storage methods is worth three times what it used to be, and each unit of labor in geting the coal to your boilers has also trebled in cost. That is why some of the elaborate coal-and-ash-handling systems that seemed applicable only to the very biggest plants are today of very real value to even the moderate sized industrial establishment.

Let us assume that you have eliminated all the preventable wastes and losses formerly present in getting the coal to your boiler-room (though investigation shows that fully two-thirds of our industrial plants have failed to do even this.) Now that the coal is about to perform that service for which is was mined, transported, delivered to your plant and brought to your boilers, what chance are you giving it to yield up its every unit of energy in useful

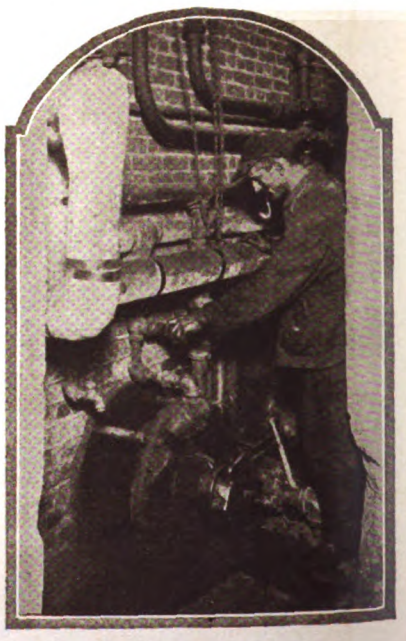
(*Continued on Page 48*)



The steam flow meter gives a record of the amount of steam actually delivered to the steam lines.



A CO_2 garage mounted near the fire-door, enables the fireman to keep tabs on the flue-gases, and to remedy faulty combustion.



Installation of blowers gives a controlled draft for the fires. Mechanical draft has in some cases almost doubled the existing boiler capacity.



The holes in the boiler-room floor are inlets to the ash conveyor—

—Ashes are shovelled to these holes, whence the steam-jet conveyor-pipe carries them away.

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and
MORTARS

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HARD-N-TYTE
For
CONCRETE
and
MORTARS



Grace Dodge Hostel, Washington, D. C. 110,000 square feet of floors treated with HARD-N-TYTE
Architect, Duncan Candler; Builder, Wm. Crawford; Contractor for floor treatment, Gen'l Floor Maintenance Co.

You can't buy a better floor than concrete treated with

HARD-N-TYTE

In manufacturing plants, public buildings, warehouses, office buildings, hotels—any building where floors are subjected to the destructive effects of heavy trucking or foot-traffic—

—finishing rooms, where fine furniture, musical instruments or motor cars are varnished—in candy factories, motion picture developing rooms—in a hundred other industries where dust is an enemy,—

—HARD-N-TYTE gives dust-free, wear-proof concrete floors.

No mystery is involved—HARD-N-TYTE is merely the registered trade-name applied to pure white crystals of magnesium and zinc fluosilicate. When dissolved in water and flushed on the concrete floor according to our simple instructions, HARD-N-TYTE combines with the hydrated cement and forms a steel-hard, wear-resisting, dustless surface.

The Hard-n-tyte Specification

has been prepared for your assistance in building durable, dust-free concrete floors, and will eventually mean to floors what "Barrett" does to roofs. Full details concerning the HARD-N-TYTE Specification, and valuable advice on the laying of concrete floors and the painting of concrete surfaces may be had from any of the sales offices listed here. Address the one nearest to you.

General Chemical Company

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We Must Produce!

WE must produce. Production is the first and last necessity. Everything else in life, food, clothes, shelter, pleasure, and profit, depends on production. In war, cost was not the question—it was production at any cost. In peace it was just as important, but we now must meet the *prices* of competitors, else they will have all the production—all the income—all the profits. America must meet Europe and Asia on their own ground of price and quantity, and beat them. If we put our minds, our resources of men, material, machinery and money into the job we can do it—*Provided we train the minds that direct and control.*

Industrial America is calling to the ambitious man to train himself—as they did at West Point and at Plattsburg—for the special work of handling the men, money, machines and materials out of which America's Industrial Supremacy must be fashioned.

The foreigner who sells his goods in the market you should have, takes what belongs to you.

You can beat him, America's great machine and man power guided by its competent management, can meet this Competition and beat it.

America *must* beat it.

She must solve the problem of economical production. She must put her great funds of money, her matchless machine equipment, her enormous stores of material, her skilled mechanics, and the *Brains* of her managers *to work*.

It is a problem of Industrial Management. America must officer this vast industrial army with competent Managers.

There is a demand for competent Managers, i. e., superintendents, assistants, plant managers, who understand the problems of economical production. The recent investigation by a body of expert manufacturers, engineers, and investigators proved that 50% of the waste in our industries was due to bad, incompetent and uneconomical management. Much of this is due to lack of competent assistants, men who can carry out the plan.

It is estimated that America could today use 300,000 men trained in Industrial Management problems—that would be but one to each plant.

The Problem and the Answer

Yet investigation shows that only 10% of these plants actually know what their costs of production are; at least ⅓ of them do not earn a profit, and the amount of actual waste each year amounts to millions of dollars.

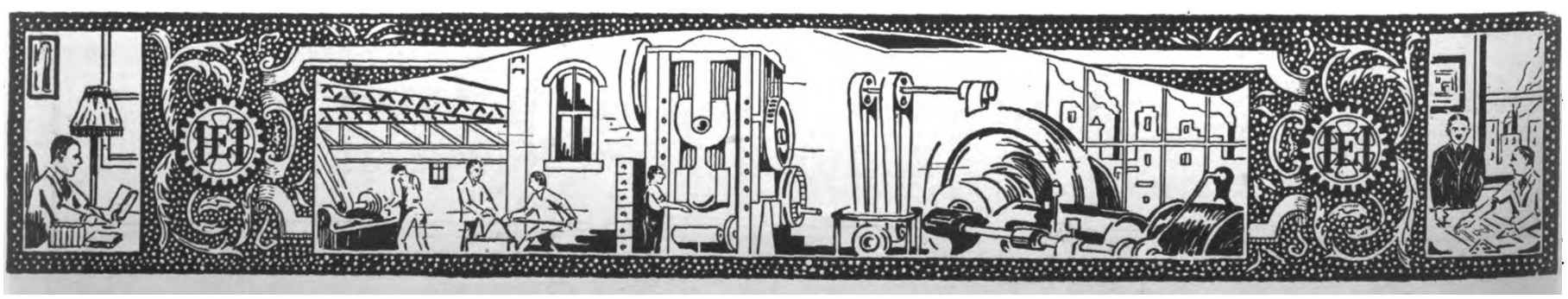
Waste comes from ignorance and that from mismanagement. Lack of trained men to direct these organizations at work has made it necessary to select men from the ranks of industrial workers who, though having some native executive ability, know only what they have learned from personal experience of the science of modern industrial management.

These men have done wonders. They "got by" when the world was not hunting markets from which to get money to pay off its debts. Now the best brains of Europe and Asia are directing their production energies against America—to get American trade at home and abroad.

Our men have overcome enormous difficulties by pure grit, determination, and invention. There has been no opportunity for them to get the same basic training which has been offered to the prospective doctor—or lawyer—or engineer. They have had only the long, hard school of personal experience with its thousands of heart-breaking failures and misdirected effort. The time has come when we must use this man-power economically. We must cut out this waste.

The Remedy

Industry is awakening. The old rule-of-thumb system is going. It will never return. The thinking, farseeing men of industry are eagerly seeking a working knowledge of methods which have been successful, of practice that has been established—so that the "guess waste" may be taken out of production.



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This is where the Industrial Extension Institute functions. It offers a proven method of training men in the principles and practices of the science and art of modern industrial engineering and management.

Five years ago the Industrial Extension Institute with the co-operation of more than sixty prominent and successful industrial engineers and executives prepared the Factory Management Course and Service, built entirely on the university plan of lectures, texts, model problems and a consulting service (by the Correspondence Plan) in which sixty trained, experienced, practical and successful industrial specialists participate. This Course offers the only means of securing an organized training in the fundamentals which pertain to the control and operation of men—methods—material and equipment.

The Factory Management Course and Service is arranged to be an interesting and practically helpful assistant to the manager who is *now* directing an industrial organization, to bring the romance and art of management to the man who has been seeing only the technical side, to be a directing and helpful influence to the young man just out of technical school or college, and an inspiration and an asset to all of those young men who are industrial workers and who are doing their bit in their own way to keep this world a fine, comfortable place to live in.

Increase Your Income

An analysis recently made shows that the Industrial Extension Institute men have increased their incomes between 200% and 400% over a period of three years and their salaries range from $2,500 to $25,000 a year. The average salary of all men who have received the Institute's training was at the time of enrollment $170 a month. The average salary two years after enrollment was $307 a month. There are special cases also. One man who started with a salary of $3,000 a year and after three years was earning $12,000 a year. Another who jumped from $3,600 a year to $13,500 a year. Another who increased his salary from $10,000 to $25,000 a year. The Industrial Extension Institute has helped these men to do bigger and better things, and their rewards have been substantial and enevitable.

Decide Now to Get Into the Fight

In such training lies a solution of America's production problem, for right thinking leads to right judgment, and a right judgment gives competent, economical management the necessary beginning to economical production.

This is your opportunity. Are you going to take advantage of it? Today?

The Industrial Extension Institute and its staff, all practical, successful men, are engaged in training an army of active, working, thinking men, for the intensive, vigorous fight for industrial supremacy for America.

The Industrial Extension Institute is the clearing house for a great mass of valuable industrial information. Its staff constantly perfecting new methods and establishing new practices which an industry needs today.

All of these facilities are available to you.

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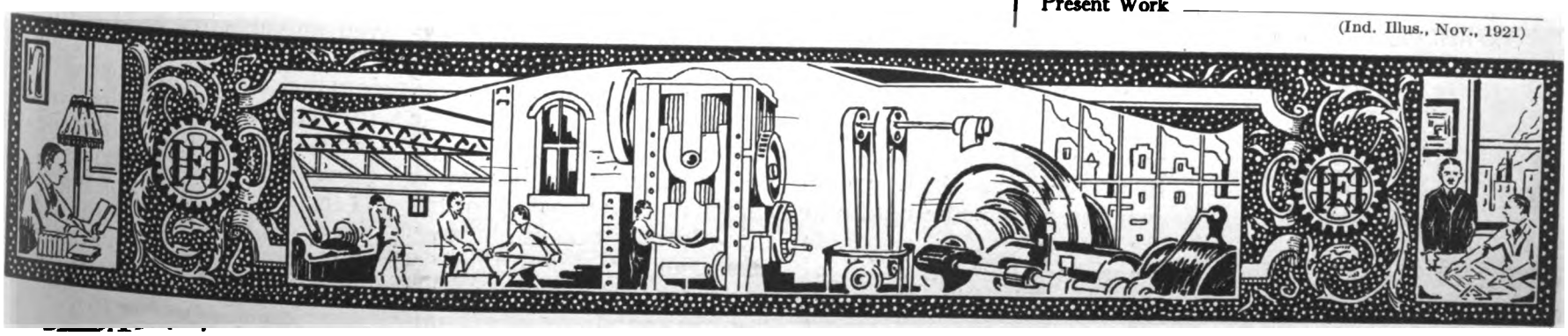
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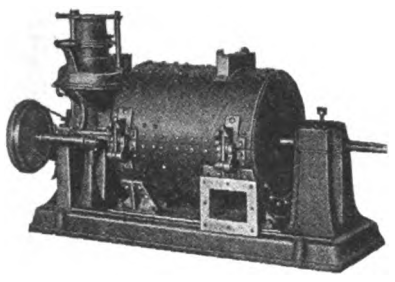
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(Ind. Illus., Nov., 1921)



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Pulverized Coal



The Aero Unit System

of Pulverized Coal again demonstrates, as in other work of human endeavor, how an original idea at first worked out by complicated and costly methods is finally simplified and perfected until it becomes a part of our every day existence.

The Unit System reduces the equipment and therefore the cost to a minimum by placing the Aero Pulverizer at the furnace where the coal is fed to the machine undried and is exhausted therefrom directly into the furnace. There are no dryers, no storage or long lines of transportation for the powdered coal, thus eliminating the hazard of fire or explosion.

Each Aero Pulverizer is designed as a complete powdered fuel unit for one furnace. They are built in standard sizes ranging from 600 lbs. to 5000 lbs. of coal per hour.

Bulletin Sent on Request

AERO PULVERIZER COMPANY

165 Broadway
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Bringing Inventive Genius and Capital Together

(*Continued from Page 6*)

altogether the possibilities of *invention* multiplying the effectiveness of our means of doing work a thousand fold at one stroke!

It was with this thought in mind that the editor took the express elevator to the 51st floor of the Woolworth Building to see what Dr. Miller Reese Hutchison, one of our most successful inventors, had to say about it. And before you go any further if you are not already acquainted with Dr. Hutchison, read the following brief outline of his career.

He was born in Montrose, Alabama, in 1876, and before he was 19 years old had produced his first invention, a lightning or heavy current arrester. He is an electrical engineer and is a doctor of philosophy. During the Spanish American War Dr. Hutchison was chief electrical engineer of the United States Lighthouse Establishment, 7th and 8th Districts, and was engaged in laying submarine mines and cables in the gulf harbors.

In 1899 he established the Hutchison Laboratory in New York, where he invented and marketed many electrical and mechanical appliances, among the most celebrated of which are the Acousticon for the deaf, the Klaxon horn, the Dictograph, etc. He was presented by the Queen of England with a special gold medal in 1902 for exceptional merit in the field of invention.

From 1910, until the recent war, Doctor Hutchison was associated with Thomas A. Edison becoming Mr. Edison's chief engineering advisor. During the war he was appointed member of the Naval Consulting Board and devoted his entire time to government service.

"Invention," replied Dr. Hutchison to my question, "is perhaps the most important constructive force in our economic life. We take it for granted and few people appreciate its daily application. But inventions shadow our every step from the cradle to the grave. Our food is planted and harvested with invented machinery; it is distributed throughout the world on invented freight cars and motor trucks; it is cooked in invented stoves and ovens and sometimes eaten with invented teeth. We come and go from our work on invented means of transportation—if we walk it is on invented shoes and socks. All of our daily activities in business and industry are expedited and made possible by inventions. Our leisure moments are soothed by music from invented musical instruments or brightened by invented motion pictures, and when we die we are placed in an invented casket, carried away in an invented hearse and lowered into the grave by means of an invented lowering device."

Dr. Hutchison certainly is in a position to be able to appreciate not only the benefits of invention to humanity, but also its benefits to the inventor, providing the latter has sufficient business ability to reap the reward of his accomplishment, or can find a partner who has necessary commerical instincts and honesty. For Dr. Hutchison has to his credit several hundred inventions of products made and sold, the income from which he estimates roughly to be in excess of $60,000,000.00. He himself, being a business man as well as inventor, has reaped his reward, the Klaxon horn alone bringing him more than $500,000.00 in royalties and otherwise.

It is with the thought of providing an organization that will act as an intermediary between the inventor who may have a good idea but who may or may not be a good business man, and the capitalist who has money to invest but who may not be a good judge of inventions, that Dr. Hutchison has formed Miller Reese Hutchison, Inc. It is a plan, by the way, that entered his mind as a boy, shortly after he made his first invention in 1895, a lightning or heavy current arrester. It is an idea that he has pursued for 25 years steadfastly, and that he is now in a position to perfect, partly because he has made sufficient money to do so, but more largely because his success as an inventor and his experience with inventions gives him the confidence of capitalists and business men.

"If you were ordered to build a bridge somewhere in Kamchatka," said Dr. Hutchison, "aside from the physical labor that might be involved, it would not be a very difficult undertaking because you could go to one authority and find out exactly how to build your foundations, to another authority to find out exactly how to proportion the stresses in the girders, to another and find out the best way of riveting the members together, to another and find out exactly how to proceed step by step to put the members in place. In other words, it would be a matter of straight engineering, and after the bridge was finished there would be no excuse for its failing to carry its load, and in fact a considerable overload, just as the Brooklyn Bridge has been doing for years.

"Contrast this surety of construction with the ordinary process of inventing. An invention usually comes into being without any idea on the inventor's part of its marketability, very little idea of patentability and legal standing, and in the majority of cases with somewhat hazy ideas of its practicability. This is not said in derogation of inventions by any means, but as a rule they are one man affairs and one man affairs do not get very far today.

"Our organization is formed to take a limited number of the most promising of these one man affairs that have been recommended to us as really likely to be of economic importance. We then become guardian to the embyro invention. Our first question is 'will it fill a need'?" To find this out we call into consultation the foremost economic authorities that we can find and get their opinion. The next question is as to the correctness of theories involved and this we ascertain in the same way. Next we go into the question of patentability; status of protection, infringement, etc., with the same degree of detailed care. If the embyro invention meets these tests successfully we start to bringing it into proper marketable form via the draw-

(*Continued on Page 39*)

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Take a Birds-Eye View Of Your Business

Here are the five big elements—the five fundamental divisions of business; (1) *Organization;* (2) *Methods and facilities;* (3) *Cost and Cost Finding;* (4) *Statistics;* (5) *Policies.*

How a scientific study of these elements can, first stabilize, secondly, increase proportionate profit, and thirdly, increase the volume of any business are clearly outlined in the book shown above. It is available to all executives. Write for it today.

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SAMUEL OLSON & COMPANY

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CHICAGO ILLINOIS

Fifth Avenue Building
NEW YORK CITY, N. Y.

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(Continued from Page 37)

ing board. Throughout every step in its design we bring in consultants—the best qualified specialist engineers—to criticise, condemn, or approve the functioning or the design of each individual part. When we have gotten through with this ordeal we build a machine and that machine is run under heavy overload until one part or another breaks or wears out. After we have produced what we believe to be the best commercial form of this invention we put a number of machines in the hands of the type of users who will probably give it the most abuse,—and the least care and thus the greatest punishment. As the machines go out of commission in one detail or another these details are finally perfected.

By the time we have gone through this procedure the invention is no longer an idea but a *concrete reality* put together step by step with engineering skill, and will perform its function just as surely and safely as the bridge that I mentioned. After this end has been arrived at, it is a simple matter, of course, to get capital to place the perfected invention on the market."

Dr. Hutchison showed the editor, in confidence, some of the inventions that his organization is in the process of "daddying." Each of them is characterized very markedly by two qualities. The first is the fact that each is of very broad application, either to industry or to the home. The second is that, in each case, the advantages over the prevailing methods employed are so great as to be safely called revolutionary.

Dr. Hutchison has associated with him, in this effort to assist industry and mankind through the "engineering" of inventions, such distinguished men as Hudson Maxim, Rear Admiral Samuel McGowan, Paymaster General of the U. S. Navy (retired) William M. Williams, recently U. S. Commissioner of Internal Revenue, F. D. Carneg, the well known metallurgist, Alfred D. Flinn, deputy Ch. Engr. in Catskill Water Supply Construction, etc., and Sir Edgar Rees Jones, formerly of the British Ministry of Munitions.

Which Comes First—Price or Production?

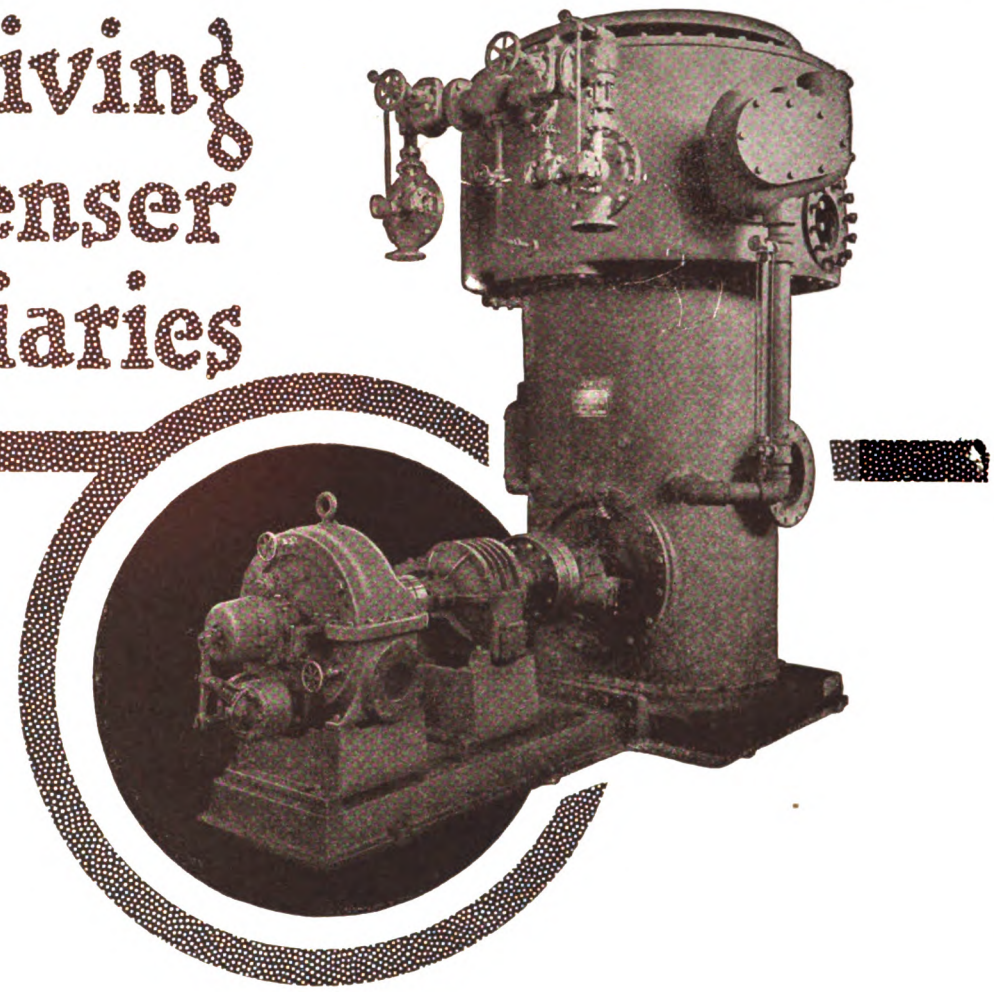
(Continued from Page 6)

ing and regulating is largely done by machinery. Thus the human skill and supervision normally expended in the making of a single watch has been spread, through automatic machinery, over thousands of watches, diluting the cost in like proportion. "Easy enough," says the casual visitor, "to see how they make a watch for that money after you know how it's done!"

But the big question, it seemed to the editor, is "How did they get the thing going?" Here is an *established cycle* consisting of enormous production, highly specialized machinery, low cost and low selling price all going around in a circle and each element dependent upon another as cause and effect. It is like the old problem of the hen and the egg—which came first?

We asked Mr. Ingersoll to tell our readers how he knew he could make a watch for so

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IN any auxiliary drive dependability of operation is of paramount importance. Terry turbines receive their energy directly from the boiler, avoiding the cycle of main unit, generator, switchboard, fuses and wiring required by motors. They are therefore free from all external disturbances except boiler failure.

Extreme simplicity of construction reduces internal disturbances to a minimum, a fact proved in over 8,000 installations in successful operation.

For your removal pump, injector pump, circulating pump or hot well pump unit, you will be assured dependable service if you

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Offices in Principal Cities in U.S.A. also in Important Industrial Foreign Countries

The Terry Steam Turbine Co.
Terry Sq. Hartford, Conn. U.S.A.

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little money before he started to manufacture, and how he knew that one dollar was the "psychological" price for those days and how he could afford to sell them at such a low price before getting up to quantity production.

"There are two schools of merchandising," said Mr. Ingersoll, "one school believes in making things that will sell to a limited number of people who are able to pay all that the traffic will bear. There is plenty of room in this world for this school of manufacturers and merchandisers—they are needed just as much as the artist who disregards the element of time in painting a picture, so long as he gets it as nearly perfect as possible. The other school" (Mr. Ingersoll modestly neglected to mention that he was one of its principal founders) "believes that the market for penny apples, so to speak, will always be much greater than that for three for a quarter varieties. The latter school takes as its objectives a low market price, great production, a high degree of standardization, and the shortest practical line from the manufacturer to the consumer.

"Low priced small clocks existed before we started out o arrive at a low priced watch. Therefore, we followed the general idea of the clock which we knew could be made at a comparatively low price. We simply took advantage of the "state of the art" so to speak as it existed at that time i. e., 1892 and made use of clock skill, clock labor, clock methods, clock machinery and clock material. To test the salability of our first watch at one dollar we advertised it in an issue of our "mail order" catalogue which represented our business at that date. For two years thereafter, however, until our production had become built up to the point of warranting the lower selling price, we sold these watches for a dollar and a half, and were making money when the price was reduced and would have continued to sell at $1.50 indefinitely but our goal was a Dollar Watch and so we broke the price to one dollar, creating the watch sensation of history.

Simple after all, isn't it? But most things are simple, especially the big ones, after you know how they are done. Thinking up simple things and simple ways to do things is a hall-mark of genius and is what differentiates the truly big man from the fussy little one. Keep this rule in mind when you have occasion to measure a man.

The secret of success, such as Mr. Ingersoll has had, lies in having an ideal and sticking to it. Mr. Ingersoll, in the early days, had determined that a dollar was the right price in those times to develop his biggest market. He must have taken an implicit belief in this to reduce the selling price from a dollar and a half to one dollar, in view of the fact his business was progressing rapidly and profits being made at the higher price. But wisdom of the move was soon demonstrated and the Ingersoll business "grew like a snowball" to its present huge proportions.



The Winning Evidence a—PHOTOSTAT Copy

THE case hinged upon the ability of the prosecution to produce certain documentary evidence. The original had been lost. In fact the defence, knowing that it had disappeared, already considered the case won.

Then the unexpected happened. The Prosecuting Attorney introduced a PHOTOSTAT copy of the original document which had been previously made and filed as a matter of precaution.

The tables were turned—for PHOTOSTAT copies are legal evidence, because they are made direct from the original.

PHOTOSTAT copies of important documents are not only uesful for filing as a precautionary measure in case of litigation, or in case of loss by fire or otherwise, but can also be sent out instead of the originals when desired.

Consider the importance of this in those numerous business controversies, which never reach the court room, but where a settlement can not be reached until valuable pieces of documentary evidence have passed from hand to hand several times.

Consider also the incalculable value of a duplicate file of drawings, plans, etc., if a fire loss should come.

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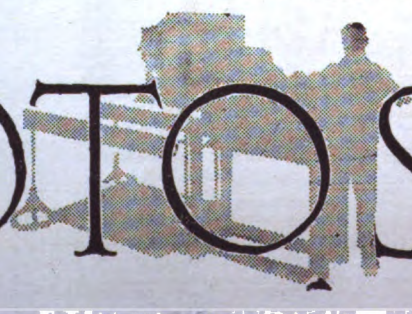
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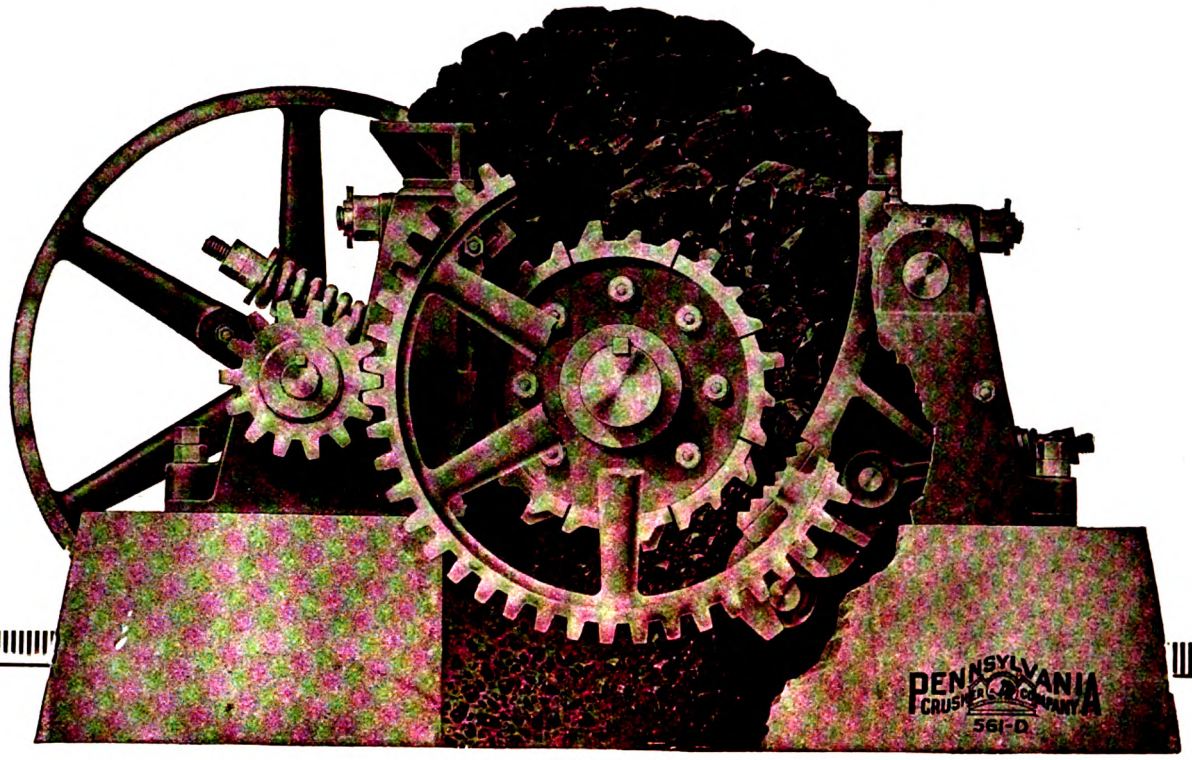
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"PENNSYLVANIA" COAL PREPARATION MACHINERY

SINGLE ROLL COAL CRUSHER

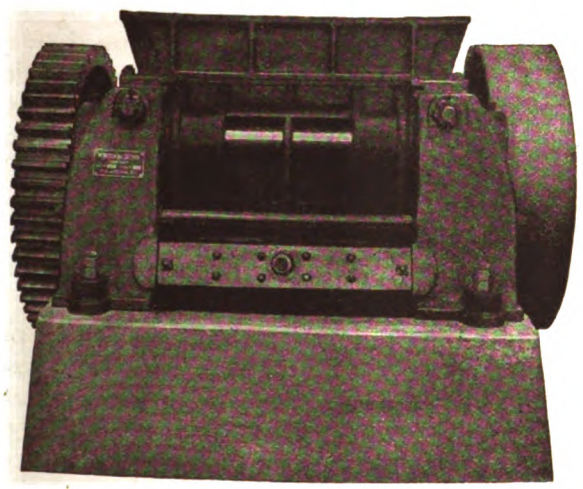
The "Pennsylvania" Single Roll Coal Crusher prepares R. O. M. Bituminous coal to the uniform sizes required for each type of Stoker.

Powerful relief springs and shear pin device afford double protection against the accidental introduction of tramp iron. Maximum reduction is secured in one operation.

The "Pennsylvania" Single Roll Crusher is a self-feeder, massive in construction, and equipped with our new type of segmental roll permitting quick change when rarely necessary, without disturbing hopper connections.

These Crushers have been specialized for use at Mines and in Industrial Power Plants, Gas Works, Central Stations, and Gas Producer Departments.

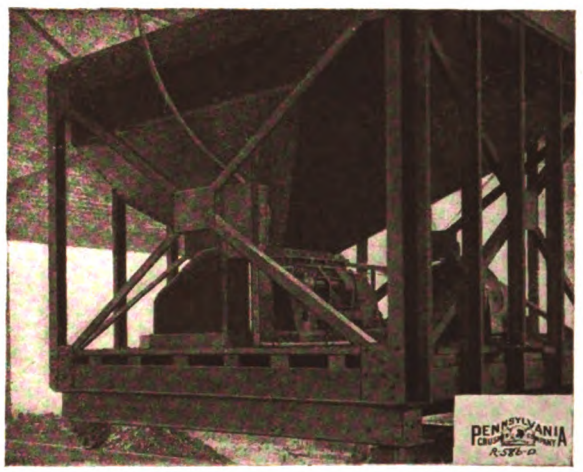
Capacities range from 20 to 400 tons per hour.



24"x30" New Series Class "B" "Pennsylvania" Single Roll Coal Crusher, showing rugged back gearing, cast iron hopper and flywheel pulley.

Builders of "Pennsylvania" Bradford Coal Breakers and Cleaners and "Pennsylvania" Steel Frame Hammer Crushers, specialized for coal preparation in By-Product Coke Plants, Central Stations and Mines — also powerful primary and secondary crushing equipment for Cement, Lime and Gypsum Plants, and crushing, pulverizing and grinding machinery for Chemical Plants.

Illustrated Bulletins in Binder Await Your Mailing Instructions



24"x36" New Series Class "B" "Pennsylvania" Single Roll Coal Crusher, mounted on car with individual motor and special hopper to receive grab bucket feed, preparing Gas Producer Coal in Steel Works.

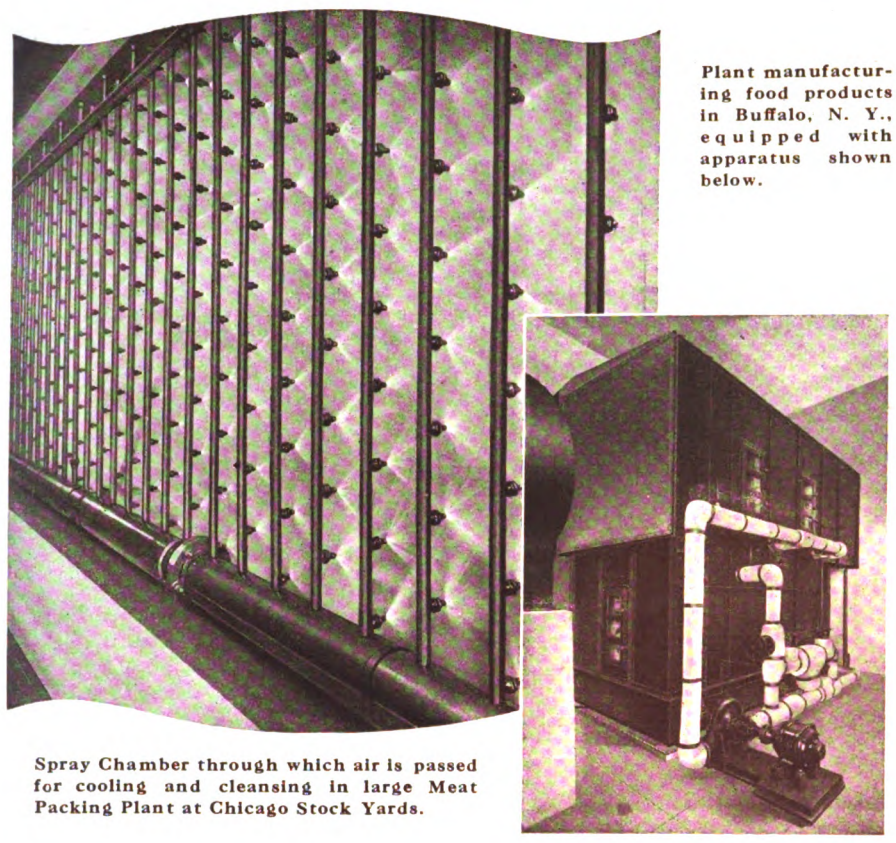
Put Your Coal Preparation Problems Up to Us

PENNSYLVANIA CRUSHER COMPANY
PHILADELPHIA PITTSBURGH

Stephen Girard Building, PHILADELPHIA

NEW YORK PITTSBURGH

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Plant manufacturing food products in Buffalo, N. Y., equipped with apparatus shown below.

Spray Chamber through which air is passed for cooling and cleansing in large Meat Packing Plant at Chicago Stock Yards.

AIR CONDITIONING APPARATUS

is the advanced stage of modern ventilation particularly adapted to industrial plants in which the process of manufacture or the particular product is influenced by atmospheric changes.

Where the variation in out door weather conditions, from day to day or even hour to hour, adversely influence the working of the product.

When an ideal temperature or relative humidity is desired, the modern engineer can produce it within spaces large or small, thus assuring continuous production of the best quality in the maximum quantity.

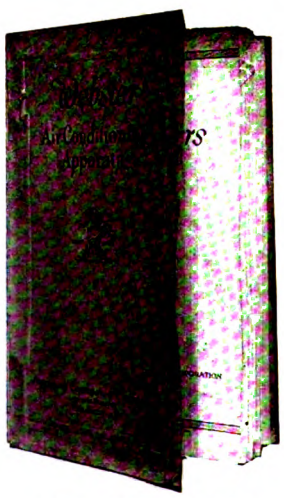
The art has reached a high state of perfection and in various forms can be made to produce just the atmospheric condition to suit any requirement.

The removal of dust and foreign matter from the air is common to all types in addition to which moisture in any percentage can be added to or removed from the air whether it be taken wholly or in part from out of doors.

The recirculation of spray water for the simpler forms: the use of deep well water in single or double stage equipment or the utilization of refrigeration in the more complex problems have all been met and our engineers are at your call for consultation or service for the betterment of your manufacturing conditions.

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Button Manufacturers
Celluloid Products
Chemical Plants
Cooperage
Dairy Products
Electric Lamp Works
Film Manufacturers
Food Products
Gas Mantels
Glue Manufacturers
Hat Manufacturers
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Leather Manufacturers
Lithographing Plants
Packing Plants
Silk Mills
Textiles



SEND FOR THIS CATALOGUE

Atmospheric Conditioning Corporation
469 Chestnut Street
PHILADELPHIA

Does Labor Benefit Through Invention?

(*Continued from Page 7*)

Richard Arkwright. And it was this same apprehension which, just a few weeks ago, caused the members of a sheet metal workers' union in England to go on strike because their employers, who used oxy-acetylene welding torches, would not allow twenty-five helpers to "stand by" each torch where two men were enough to do the work.

Of course, all of us who read this magazine have a fairly definite conviction that the invention of labor saving machinery is a good thing for labor as well as for everybody else. But we all like to have the opinion of those who are best qualified to speak about things, and so the editor asked Frank M. Leavitt about it. Mr. Leavitt, by the way, being a graduate of the first four year term class in mechanical engineering that Stevens Institute turned out, has had a long experience observing the effect of his own and others' inventions, and while he himself is perhaps best known as the inventor of the Bliss-Leavitt torpedo (the torpedo of the United States Navy) his inventions in the sheet metal machinery field have fairly revolutionized a large part of the sheet stamping and drawing industry, and have given him a clear insight into the economic effects of invention.

"Does labor benefit through invention?" Mr. Leavitt repeated the question reflectively. "Perhaps the best way to answer this is to compare the standard of living of the average workingman today with that of his predecessor of a century ago. The skilled mechanic of today, for example, has luxuries and conveniences that kings and princes could not have then. They are so common that he overlooks the fact that he has them or that they are chiefly due to the product of inventive ingenuity. Inventors have made it possible for him to transform darkness into light instantly in his home by pressing a button. Invisible fuel is carried to his kitchen stove through pipes. Rapid transit gives him more range of movement in less time for a pittance than all the wealth of monarchs could command a century ago. If he desires to be amused, the voices of noted singers and the music of orchestras are brought to him on a little black disk no bigger than a dinner plate, and the world's news is shown him —not read to him, but actually shown him—as it has happened. These things are so common that he, like ourselves, takes them for granted whereas they are indeed miracles — scientific miracles created by inventive ingenuity.

"We have this rapid development or extension of conveniences within the reach of the average man simply because invention—the invention of labor saving machinery—has released creative labor that would otherwise be needed to produce what we used to call the necessities. The less labor it takes to make a thing the greater number of people as a general rule who can possess it, because in most cases the price of a commodity follows its labor cost. A great many people are today riding in automobiles who could not afford to have them were it not for inventive genius and a remarkably low labor cost. If you can conceive of an automobile being produced by "pressing a button" you can imagine that the distribution would be even wider. The invention of labor-saving machinery is a step toward the "pressing the button" extreme which I have taken for illustration.

"Is there any probability that we shall be pulled out of our present day economic difficulties by a series of radical inventions?" We asked Mr. Leavitt.

"It is hardly likely," he replied. "You see inventions have a way of depending upon things that have preceded them; in other words, an invention cannot materialize until the cue is given by other inventions which have preceded it on the stage. High speed steel, for example, which helped to revolutionize the machine tool industry could not appear until certain

(*Continued on Page 44*)

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".....The benefits derived from the study of this course by our hundred foremen have been immeasurable, as the men are getting a new light on the best methods of handling their men and their departments, which tends towards better production and decreased costs, with better paid and better satisfied workmen."

E. B. BALTZLY,
Assistant General Mgr.,
Warner Gear Co.,
Muncie, Indiana



".....the interest manifested in the lectures and in the subjects has been marvelous, and we do not have a superintendent who was connected with this work who did not say that from the first meeting he was able to observe a distinct unification of effort among the foreman. It brought about a better cooperation, and was the means of acquainting each man with the difficulties the other man was up against, with the result that the men were eager to go on with the work."

F. M. VAWTER,
Baker-Vawter Co.,
Benton Harbor, Mich.

for Lower Costs in Shop Operation Look to Your Foremen

"TEAM-WORK" means more than merely good spirit in a plant. It means more than getting things done. Real team-work in your factory means getting the work done, with the least possible lost motion and friction, and *at the lowest possible cost.*

In these days when costs must be scrutinized with "an eagle eye," many leading industrial plants are looking to their foremen for the answer to the problem. Your purchasing agent can get lower prices on materials, but it is absolutely up to your foremen to get more and better work from the labor you pay for.

How Foremen Can Lower Costs.

Your foremen are the "key men" in your production force. If they are good executives as well as good mechanics, if they understand the principles of management underlying their work, they can "make things hum" in the shop, and still keep costs at the proper level. But too often they are untrained. The result is lowered production, lost motion and friction, high and costly labor operations and turnover, and even the serious possibility of the plant disruption.

The Newest Methods in Foreman Training

Many companies realizing the need of developing the executive ability of their foremen, have sought to fill the gap by conducting regular foremen's meetings, at which the routing problems of the shop are discussed. A far better and more practical plan is to give their foremen and other key men about the plant an intensive group training in modern production methods which will develop their executive ability.

Because of their success in adapting this training plan to the peculiar needs of foremen, the Business Training Corporation, of New York, has been engaged to carry on this work in more than 500 leading plants, representing almost every type of industry.

The popularity of the course with the thirty thousand employees enrolled is due to the clear, simple, and eye opening nature of the study methods. The foremen like it because it holds their interest throughout and leaves them with a new insight into their jobs. It has made good with the management because it develops a greater spirit of teamwork in the plant, energizes the men to more productive effort, and has an appreciable effect in reducing labor turnover and costs.

Your big problem today is economical operation. You should therefore read our brief report "Making Better Foremen," which we gladly send to executives without obligation. It gives all details of our unique plan, and the experience of some of the well-known concerns who have used it.

Business Training Corporation

"Greater Team Work Through Group Training."

185 Madison Avenue New York City

Business Training Corporation 185 Madison Avenue NEW YORK, N. Y.

Send me without obligation the Special Report, "A Plan for Making Better Foremen."

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*Position*_____

*Number of Employees*_____

_____

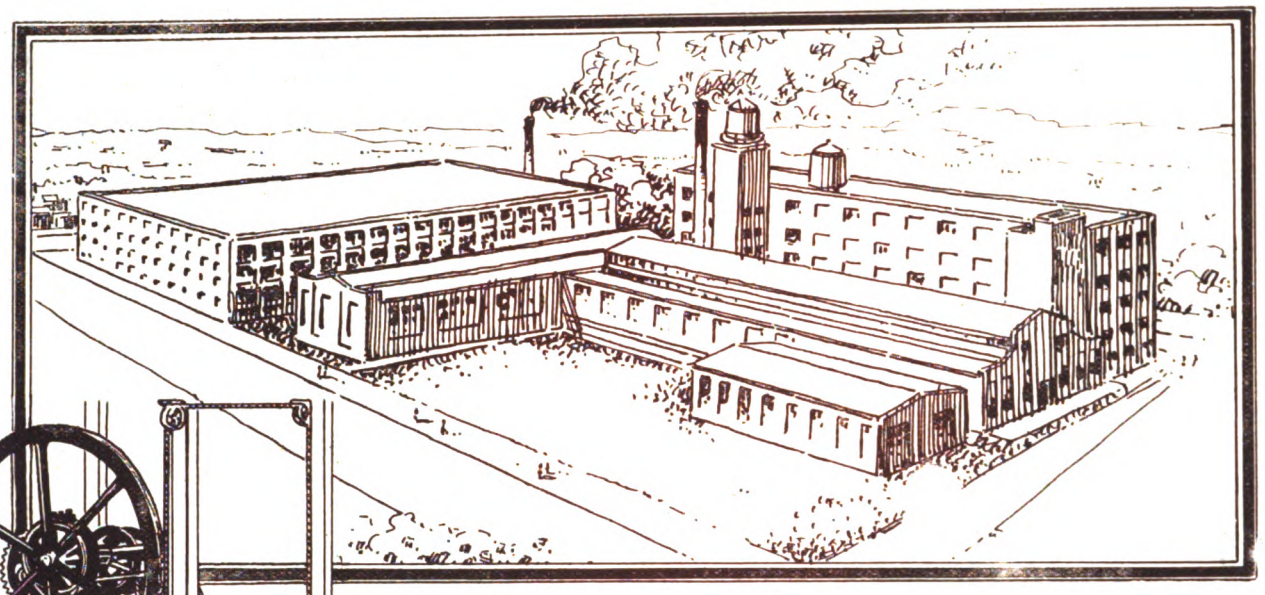
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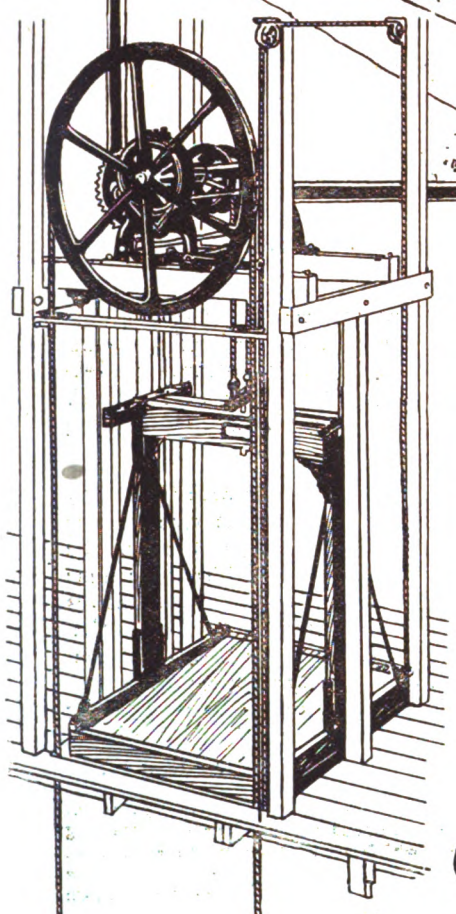
(Continued from Page 42)

things had been accomplished in the steel making industry. And after high speed steel did appear, it necessitated an almost complete redesigning of our machine tools so that they might live up to its superior capabilities. Thus we seem to advance step by step although the steps are becoming more numerous as time goes on."

Mr. Leavitt's first important invention was the automatic can making machine which practically revolutionized the can making industry. When the first machine was produced the builders had in mind only one concern in the world whose production, so they thought, was large enough to warrant its use. It is in very general use today.

Mr. Leavitt was last year given the honorary degree of Doctor of Engineering by Stevens Institute.





Look at the List of Users

Here are leaders in practically every field of American industry who know from experience the value and quality of Sedgwick Dumb Waiters and Hand-Power Elevators.

For moving materials, tools and products, finished or in process, from floor to floor—for the transmission of books and papers between office floors—for innumerable purposes where the use of power elevators would prove uneconomical, and to supplement or supplant power elevators—Sedgwick Dumb Waiters, Hand-Power Elevators and Gravity Lifts effect substantial savings and increase production efficiency.

SEDGWICK machines require no skilled operators, are moderate in first cost, involve no expense for power, and practically no maintenance cost.

Our thirty years of experience in adapting this class of equipment to industrial requirements is at your service. Send for bulletins and descriptive literature.

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Dumb Waiters and Hand-Power Elevators

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Cadillac Motor Car Co.
The Childs Restaurant Co.
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Edison Phonograph Works
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"Do It Electrically"

(Continued from Page 15)

whether it be surrounded by bare walls or displayed in a homelike setting; yet the "atmosphere" created by a few draperies and a floor lamp had a marked effect in stimulating sales. An electric fountain in the show window of a well-known maker of fountain pens drew the attention of thousands, while the the balance of the display was cleverly designed to convert their attention into interest and action; a result whose success was attested by the crowds which entered the store.

These are but a few examples of the underlying idea which, in the rough (literally so!) actuated the Baxter Street clothing merchants. You can have the most aggressive sales force extent, the most excellent merchandise procurable; but, unless you can attract possible purchasers, and interest them sufficiently to make them come to you, your other two factors are useless. And electricity, by its versatility and by its element of mystery, is capable of performing wonders in this direction.

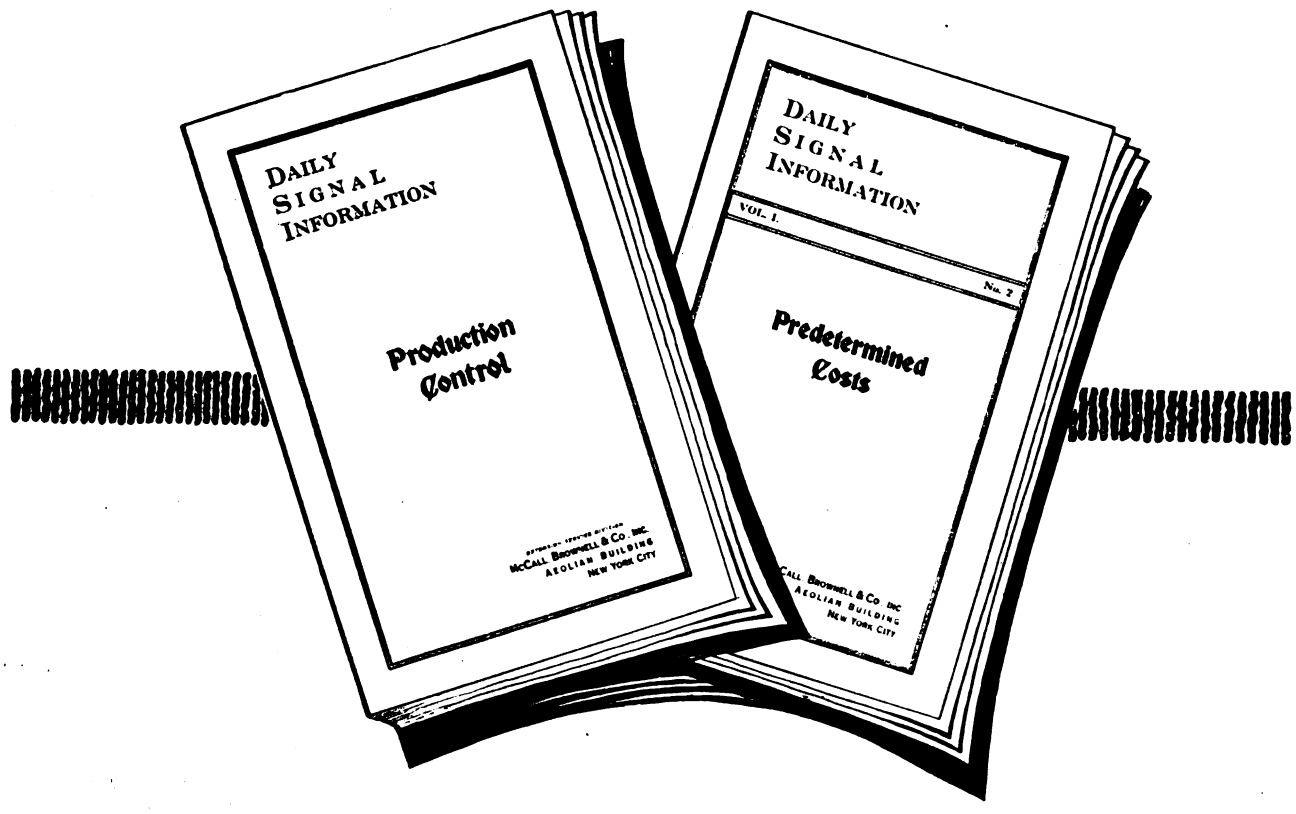
Getting 100% from the Delivery Fleet

(Continued from Page 15)

lowing year, the cartage charge was reduced to an even dollar per ton.

In the course of conversation, we mentioned the fact that in spite of rising labor costs he had made two cuts in his charge for cartage. This brought forth the explanation that the original charge of $1.25 to the consumer had been based upon actual cost of delivery by horse trucks; that the subsequent reductions were made after full allowance for investment charges; and that the elimination of waste time in loading had so increased the trucks' earning power as to leave an added margin of profit even though the charge had been reduced one-third.

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ARE YOU READY?

*"It is our contention that through a proper analysis, standard costs for each product and process can be determined, and that these costs can be analyzed as to the time element."

**This quotation is taken from the second of the interesting series of booklets "Predetermined Costs." Each number in this series will take up specifically one feature of the several services we offer executives*

Depression and Deflation have passed on up the road. The slow, steady improvement in business that leads to prosperity is already making itself felt. Are you ready for your share of what is coming? Have you eliminated the wastes born of war-time methods?

We have compiled these two booklets—from our thirty-odd years' experience in assisting hundreds of enterprises to greater profits—to aid you in analyzing your problems. The data they contain will enable you to check your entire plan—from raw material purchases to sales—with confidenc that you have left no stone unturned.

Write for these booklets TODAY—no charge, and no obligation, expressed or implied.

McCall, Brownell & Co., Inc.

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Industrial Engineers **Organization Specialists** **Analytical Accountants**

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The J. G. WHITE MANAGEMENT CORPORATION
MANUFACTURING, FINANCIAL AND MANAGEMENT PROBLEMS
INVESTIGATIONS and REPORTS ON BUSINESS CONDITIONS
New York
43 Exchange Place

Will Standardization Help or Hurt Invention?

(Continued from Page 7)

it accepted, he would have to overcome the established inertia of standardization which has built up an investment of million of dollars.

Standardization, therefore, can be seen to work two ways. It helps the manufacturer to reduce costs by doing away with frequent changes, but it also puts a stumbling block in the way of improvement because improvement means change. Is standardization going to be a stumbling block to our inventors of the future? We asked this question of Mr. Spencer Miller, knowing that most of his accomplishments have rsulted from "improving" rather than from the radical creation of things entirely new and unheard of. In other words, Mr. Miller has produced radically new results from improving methods and mechanisms already in existence in crude form. He made possible the development of hugh tracts of swamp forest land through his application of improved over-head cableways to a new purpose. His improvements in cableway fall-rope carrier systems vastly reduced the cost of rock excavation, notably the Chicaga Drainage Canal.

But before we tell you what Mr. Miller says about standardization and what it will do to our future inventors we will tell you a bit more about Mr. Miller himself and his ways of thinking and inventing so that you will better appreciate the value of his opinions on the subject.

Spencer Miller was born at Waukegan, Ill., in 1859. He graduated from the Worcester Polytechnic Institute in mechanical engineering in 1879 at the age of twenty after which he produced his first invention of a hollow-wick candle. The next result of his youthful inventive genius was a hub lamp for high-wheel bicycles. This was fitted with an elliptical reflector for destroying the shadow of the rim and thus eliminating "headers" from hidden obstacles. He next became connected with the Link-Belt Machinery Company, of Chicago, as draftsman and in this connection produced his first important commercial invention, an improvement in rope-transmission equalizing the stresses in multiple rope drives.

In 1888, Mr. Miller was employed by the Lidgerwood Manufacturing Company and is now its Chief Engineer. He revolutionized the cypress lumber industry by his designs and invention in connection with log skidding cableways. Later, during the Spanish-American War, he devised a marine cableway and automatic tension engines which makes it possible to transport coal from ship to ship under headway at sea, regardless of the rolling or pitching of the vessels in a sea way. These marine cableways have been installed on naval vessels of the United States, Great Britain, Russia, Japan and Italy. The marine breeches buoy used by the United States Revenue Cutter Service for rescuing passengers from disabled ships, is another invention of Mr. Miller's utilizing the same automatic "tension engine" which takes in and pays out the suspended hawser as fast as ships can approach or separate from each other, thus keeping the line uniformly taut under all conditions. Mr. Miller's invention of the "Button-stop" fall-rope carrier system and his unswerving determination to leave no fruitful effort unexpended to improve and perfect his cable-way system led to the adoption of his designs by General Goethals for the construction of the Gatum locks. He is also the designer of the famous "Lidgerwood unloader" extensively used at Panama in which a gigantic plow sweeps the load from a string of flat cars and deposits it in a pile at one side. His most recent invention is the Automatic Tension Towing Engine which has already proved its worth in the heaviest seas and weather.

"The inventor of the future," said Mr. Miller, "will undoubtedly have a harder road to travel to success than his predecessor. Standardization, a big factor in industrial economy, will prevent the easy adoption of something new unless it be a very substantial improvement. This is one of the advantages of standardization. Standardization may be a stumbling block to inventors, but real inventors are at their best in the presence of stumbling blocks.

"Standardization may make the path a little steeper and harder for the man with a good idea, but if the idea and the man are really worth while, they will triumph. No artificial barriers can be permanently erected against real improvements, and the standardization which makes it harder for the inventor to obtain recognition will in turn serve to spur him on to achieve greater perfection. Standardization will never stop an Edison, Howe, Whitney, Morse or Bell."

The Story of a Pane of Glass

(Continued from Page 11)

the split cylinder softens, and as it becomes pliable the operator carefully flattens it out on the stone bed. As soon as it is flattened, the operator "irons out" the sheet, to make it as free from waves and bulges as possible. Nevertheless, window glass cannot be made absolutely flat and smooth; it invariably has a slight curve, and also is marked by the "ironing out" process. Its advantage lies in the cheapness of production, indubitably with plate glass, and for many purposes its inherent defects are unimportant. In all other respects than price, the advantage lies indutitably with plate glass, which is freer from distortional defects, stronger, and which can be made in larger sizes than window glass.

It is significant to note that whereas a few generations ago we had to go to France for our plate glass—then known as "French Plate Glass"—today we are not only making our own piate, but are exporting large quantities of both plate and window glass, and especially of wire glass.

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Is business heartless and cruel?

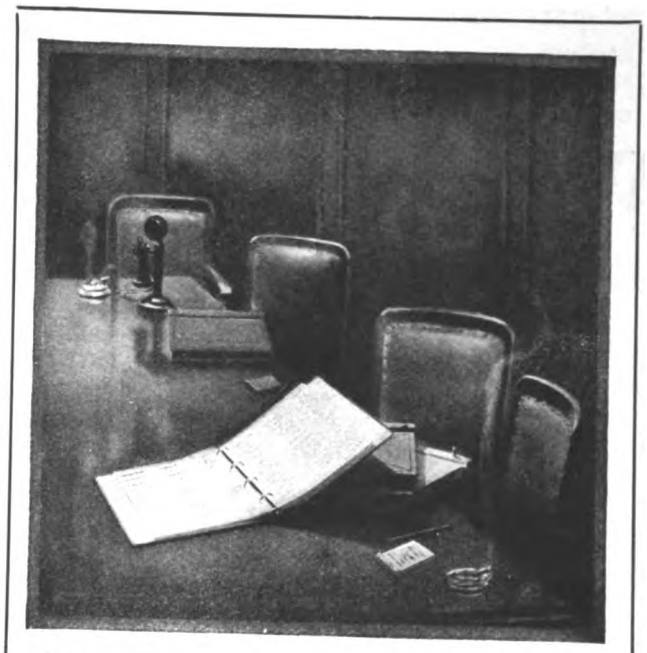
Why are six $4,000 men cut off? Why not one $25,000 dollar man instead?

IN companies all over the United States pay-rolls are being scrutinized. And time after time this happens:

A two thousand dollar man, a three thousand dollar man and a four thousand dollar man will be eliminated—a saving of $9,000. A larger saving could have been made by eliminating one $10,000 man; but the $10,000 man is kept.

Or six $4,000 men go out; but the $25,000 man remains.

WHAT is the explanation? Is business essentially cruel? Why should it visit its misfortunes on the many who are least able to bear it, instead of on the few who have prospered most?



In Board Rooms and Executive Offices the country over, salary lists are being studied and men being sifted as never before.

The answer is two-fold. The $10,000 and $25,000 men are kept, first, because it would be difficult to replace them when business picks up again.

And second, because such men understand and can perform—in a pinch—the duties of all their departmental subordinates. But the departmental man knows his own department and is useless anywhere else.

To lift men over the dead-line

THRU the center of every pay-roll a dead-line runs. Below it are the specialized men who can do one thing and one thing only.

Above it are managers, superintendents, treasurers, vice-presidents, and presidents. They know enough about the fundamentals of sales to direct salesmen; enough about costs, accounting, factory and office management, advertising and corporation finance to be effective in *any* one of these departments.

Such men are rare; no company can afford to spare them. For with them as a nucleus it can, at any time, fill in the departmental positions in its business, and expand its activities again. Without them it is lost.

It was to train men of this character that the Alexander Hamilton Institute was formed eleven years ago, by a group of business leaders. Of the thousands of men who have enrolled for its Modern Business Course and Service, 24,054 are presidents; 5,738 vice-presidents; 4,583 treasurers; 8,932 secretaries; 19,502 managers; 4,276 sales managers.

These men have business worries, as all men do; but the worry of losing their jobs is not one of them. In good times or bad they *must be* retained, they are the real essentials.

The joy of succeeding while you are young

IF you have studied its advertising, you have been impressed with the fact that the Alexander Hamilton Institute studiously avoids exaggerated claims. It cannot double men's incomes over night nor transform failures into successes in a month. But it *can* and *does* do this: It eliminates the years that too many men spend in going from one routine departmental job to another. It *does* shorten the path to success; and affords men the joy of succeeding while they are still young.

Hundreds of its men reached positions before thirty-five, which would ordinarily have come to them only at fifty or later—men like Charles E. Murnan, Vice-President of the United Drug Company; Roy W. Howard Chairman of the Board of Directors, Scripps-McRae Newspapers; Stanley L. Metcalf, President, Better Brushes, Inc.; Stephen B. Mambert, Financial Director of the Thomas A. Edison Industries. What the Institute has done for such men it *can* and *will* do for you.

"Forging Ahead in Business"

IN a single evening in your own home you can learn the full facts about the Modern Business Course and Service. They are published in a 120-page book, "Forging Ahead in Business." It is a valuable little book that should be in the library of every forward-looking man. And to men of serious purpose it is sent without obligation; send for your copy today.

Alexander Hamilton Institute
249 Astor Place, New York City

Send me "Forging Ahead in Business" which I may keep without obligation.

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Let's Be Human

(Continued from Page 19)

age, have the same likes and dislikes and have had approximately the same education; most of them are married and have families. While it is a battle of wits to get the best price on the one side and to make the most satisfactory sale on the other, there is no reason why every transaction could not be a friendly one.

The salesman does not expect to get an order from every man on whom he calls, all he asks is an opportunity to tell you what he has to offer. So let us meet him half way, give him a friendly audience and listen with interest to his proposition. Make him feel that he has had a fair and square chance at the business and whether or no he sells you, he will go away feeling kindly toward you and the company for whom you are working. It will give him renewed faith in his fellow men, and courage to keep trying. When he goes home at night it will be with a feeling of respect for the purchasing agent as a close figuring buyer, a human being and a regular fellow.

What must your sales be?

1. Do you know what sales you must have to bring sufficient income to cover operating expenses, and has a campaign been mapped out to secure this volume as a minimum?

2. Do you know what additional sales you must secure this month, next and six months hence, in order to—

(a) Increase the ratio of your current assets to current liabilities,

(b) Increase your ratio of cash to notes payable,

(c) Liquidate materials and labor sufficiently to strengthen your cash position and reduce or pay off your obligations,

(d) Reduce inventories,

(e) Justify your borrowing ability to your bankers by demonstrating that your program will permit you to meet your obligations?

3. Hand in hand with your sales program have you planned to operate in such a way as to—

(a) Concentrate upon the type of product which will sell best now,
(b) Utilize your present stock of raw materials to the utmost,
(c) Avoid the expenditure of one unnecessary dollar for labor, material, supplies and overhead?

4. Do you have a control of all activities and an enthusiastic organization back of your program who are making it further effective by—

(a) Improving routing and layouts,
(b) Analyzing all jobs and work done and adjusting working forces to insure most economical performance,
(c) Simplifying design and product.
(d) Developing economical machining and processing,
(e) Controlling production,
(f) Increasing hourly productions,
(g) Reducing unit costs?

Knoeppel Organized Service offers a distinctive service covering all of the above, starting with a

Financial Forecast

which pictures conditions as they should be from month to month, followed by a

Budget Control

which gives a current and graphic means for controlling all factors involved and both of the above as a basis for planning and executing the

Production Economy and Sales Campaign

They are today as necessary to the man who is responsible to his stockholders for the safety of a business as is the chart to the captain of a ship at sea.

A firm member of our company will call and spend a day with you without obligation, outlining in further detail what we have accomplished along this line and just how we can serve you. A line will bring a prompt response, for we realize that immediate action and quick work is usually necessary in these times.

ANNOUNCEMENT

Complying with a persistent demand we are pleased to announce that a new feature of Knoeppel Organized Service is an Engineering Appraisal Division. This will be under the direction of M. A. Bodkin, whose years of intensive work in this field eminently qualify him to maintain the same high standard in this division of service as Knoeppel Organized Service has stood for in the field of industrial management.

We solicit inquiries regarding this particularly new field of service.

Knoeppel
Organized Service

We can describe our plan briefly

ANNOUNCEMENT

As another step towards making Knoeppel Organized Service completely comprehensive, we are pleased to announce that we have organized a Division of Accounting and Auditing as an important part of our service. This will be rendered under the direction of J. Pryse Goodwin, A. C. A. (Eng.), C. P. A., (Ill.)

Those who are interested in this division of our work will be assured of the same high character of service which through years has given Knoeppel Organized Service its present reputation in the industrial management field.

We will be glad to outline further details upon request.

C. E. KNOEPPEL & CO., Inc.
Industrial Engineers

52 VANDERBILT AVENUE NEW YORK

Outgeneraling Old King Coal

(Continued from Page 32)

work? Is your boiler plant one of the few which operate at a thermal efficiency around 70%; or is it among the "average" or below-average whose wasteful performance lowers the *general average*, for all coal-steam production, to only 50% thermal efficiency?

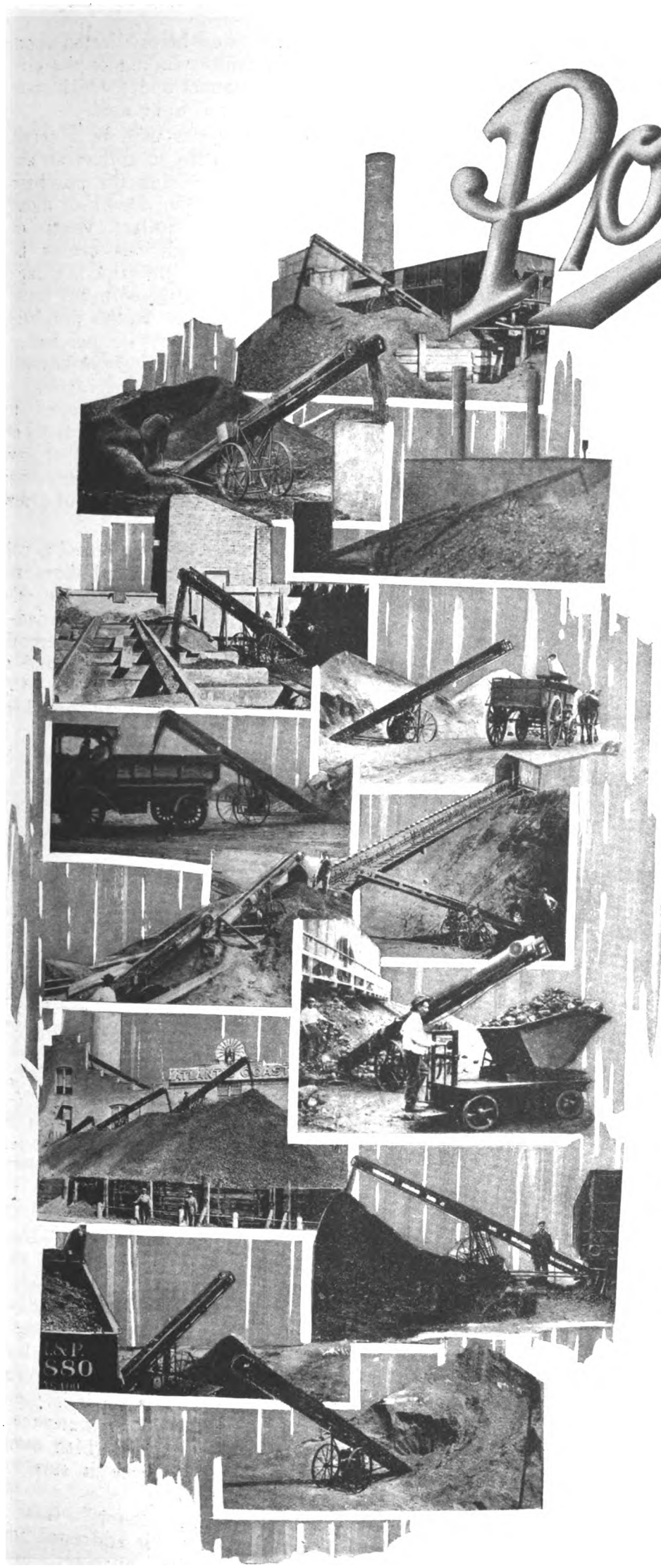
Even the best boiler-room practice involves a loss of about 30% of the heat units in coal, due to radiation, incomplete combustion, and heat lost in the flue gases. But the other fifteen to twenty per cent heat loss in the ordinary plant is not an inevitable loss. It is waste; waste easily preventable by good management.

Every pound of coal requires a certain number of pounds of air for proper combustion. Too little air means incomplete combustion; too much, results in excessive waste of heat up the stack. By watching both the temperature and the percentage of carbon monoxide in the flue gases, it is a simple matter to determine whether combustion is efficient. And blowers furnish a means of controlling the draft, while mechanical stokers assure proper condition of the fire bed at all times.

Measurements of the actual amount of steam generated in the boilers not only gives accurate cost figures, it also serves to show the engineer immediately—by comparison with fuel consumption—when performance falls below par; and he can remedy the condition before the loss in money becomes serious.

We have passed the day when it was economically possible to "shovel on the coal and let her blow." By all means let us bring down the cost of coal, if it can be brought down. But before we throw too many stones at the producers and handlers of coal, let's first get out of our glass houses: cut out the enormous coal wastes on the consuming end, and raise the average boiler-room efficiency to a point nearer the practically attainable seventy per cent.

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SCOOP CONVEYORS
for Economy

THE unique design, the sturdy construction, the completeness of the Porta Scoop Conveyor assures reliable performance and economical long time service to every owner.

This light-weight portable conveyor is a complete answer to conveying problems at thousands of plants and its first and operating cost is but a fraction of the cost of a more elaborate, but no more capable, conveying system.

And what is more, you do not have to make expensive alterations in order to install a Scoop Conveyor. It is built in different widths and lengths and it is almost certain that there is a standard size which would ideally fit your particular requirements. There is no installation cost.

Our catalogue No. 63 shows how a great number of conveying problems have been met by this machine. May we send you a copy?

Portable Machinery Co.
Passaic, N. J.

PORTABLE MACHINERY CO. PASSAIC, N.J. U.S.A.

Ask Any User

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Have You Cut Out All Your Wastes?

For Instance:—

In the middle of March (this year) we were called in to consider the problem of a certain plant whose operating costs appeared to be slightly above normal. As a result of our study, they made changes which eliminated seven men in the power plant and saved twenty tons of coal a day: a money saving of $50,000 a year. And this, merely by improving methods and repairing existing equipment, without installing any new exuipment —a typical instance of

DONALDSON SERVICE

Probably the greatest single source of waste in industry today is waste of Power — in generating and in use. Donaldson Service is based on the three essentials—TRAINING plus IMAGINATION plus COMMON SENSE—applying these three to the single purpose of eliminating all preventable losses or wastes of Power

Send for "SAVICE"—a booklet which contains information of value to every power user.

Roderick D. Donaldson
ENGINEER
35 W. 39th Street New York, N. Y.

Collection Letters that Get the Money

(*Continued from Page 13*)

Mark Withers,
Pittsburgh,
Pa.

Dear Sir:

Evidently our letter of June 29th, wherein we requested a remittance covering a past due account, has been overlooked. It happens sometimes with the best of us.

Under the circumstances will you make settlement direct, or honor a draft ten days hence through the Central National Bank?

Unless your check is received, we take it for granted that we have your permission to draw, and that the draft will be accepted.

Yours respectfully,

" You will observe that the first paragraph in letter No. 2 relates to the previous letter. We let the customer down easy for his apparent neglect; we say 'it happens sometimes with the best of us.'

"In the second paragraph we assume that he will honor a draft ten days hence, through his bank. (We happen to know the bank he deposits with from credit information, or from a record of checks received).

"A debtor, if he has any regard whatever for his credit standing, will not permit his bank to know that overdue accounts are being collected by the draft system.

"The third paragraph places before him the responsibility of the draft. If he does not pay within ten days after the date of the letter, the draft is issued, he can make no complaint for we tell him that we take it for granted that we have his permission.

"These letters have been used with slight modifications for the past ten months, and it is amusing to examine a day's collections and observe the large number of accounts that have been collected, money pried loose, through the use of these two simple letters."

Maurice T. Fleisher, President of the Notaseme Hosiery Co., Philadelphia, is in accord with Mr. Uehlinger in the belief that the collection letter must be designed to fit its recipient. Here is what he has to say about it:

"It is hardly startling to say that one's selection of 'the best collection letter he ever saw' must be predicated upon an understanding of the circumstances under which such a letter is to be used.

"A letter used by a retail credit man to collect an account covering the purchase by Mrs. Van Dusen of thousands of dollars' worth of dresses and hats cannot be couched in the same language as that addressed to her laundress for the week's purchase of groceries, if, perchance, she has not bought her supply from the 'cash and carry.'

"The letter addressed to the purchaser of hundreds or thousands of pounds of raw silk cannot be the same as that mailed to the buyer of a few pounds of nails.

"The letter intended to collect small haberdashery accounts, numbering in the thousands, must be worded—even constructed—differently than the letter addressed to the exclusive agency of a widely advertised brand of men's clothing.

"And yet the basis must be the same in all cases—the account is due—it may have been overlooked—please remit.

"I consider that a plain, dignified statement of the fact is the only permissible course and in the vast majority of cases 'brings home the bacon.' I, therefore, submit the following as my idea of 'the best collection letter.'"

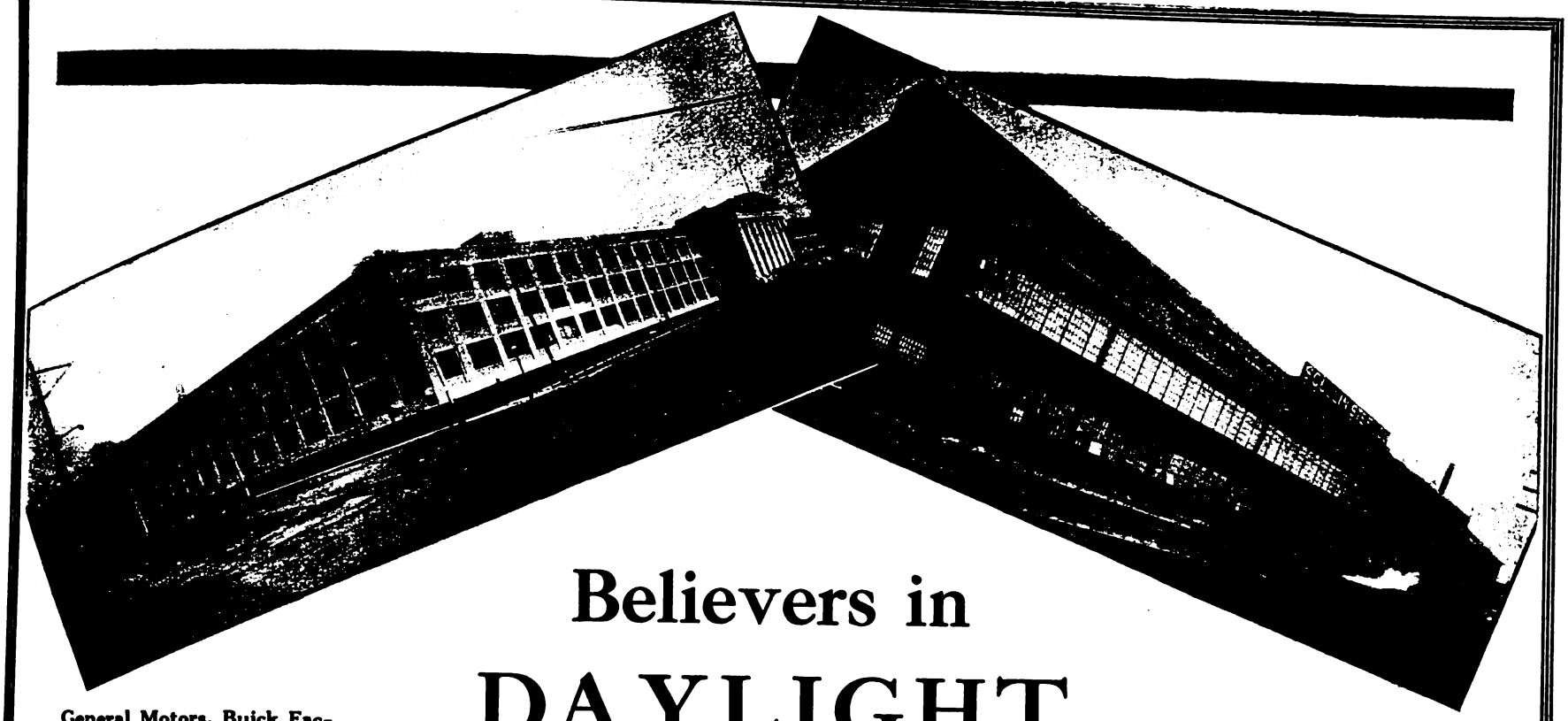
> We call your attention to our invoice of January 2nd, 1921, which is past due and which you have, no doubt overlooked. Will you kindly send us your remittance at your earliest convenience?
>
> Very truly yours,

Herbert Choate, Treasurer of the J. K. Orr Shoe Company of Atlanta, Ga., believes that the effectiveness of a collection letter falls along the same lines of the old adage which has it that the "Proof of the pudding is in the eating." He contributes the following letter which most of us will agree is surely unusual.

"This letter," says Mr. Choate, "is addressed for illustrative purposes, to the Economy Shoe Store, Prosperity, Georgia (name and address fictitious) both gotten

(*Continued on Page 52*)

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General Motors, Buick Factory, St. Louis, Mo. ⅛" Mississippi Ribbed Glass, Mississippi Polished Wire Glass.

Scullen Steel Co., St. Louis, Mo. ⅛" Mississippi Ribbed Glass.

Believers in DAYLIGHT ILLUMINATION

These are a few of the many structures that make efficient use of daylight, while at the same time minimizing fire risks. There are many types and designs of Mississippi Products.....among them, the one that suits YOUR needs.

Ask for catalog and sample of glass suitable for use as a Paperweight

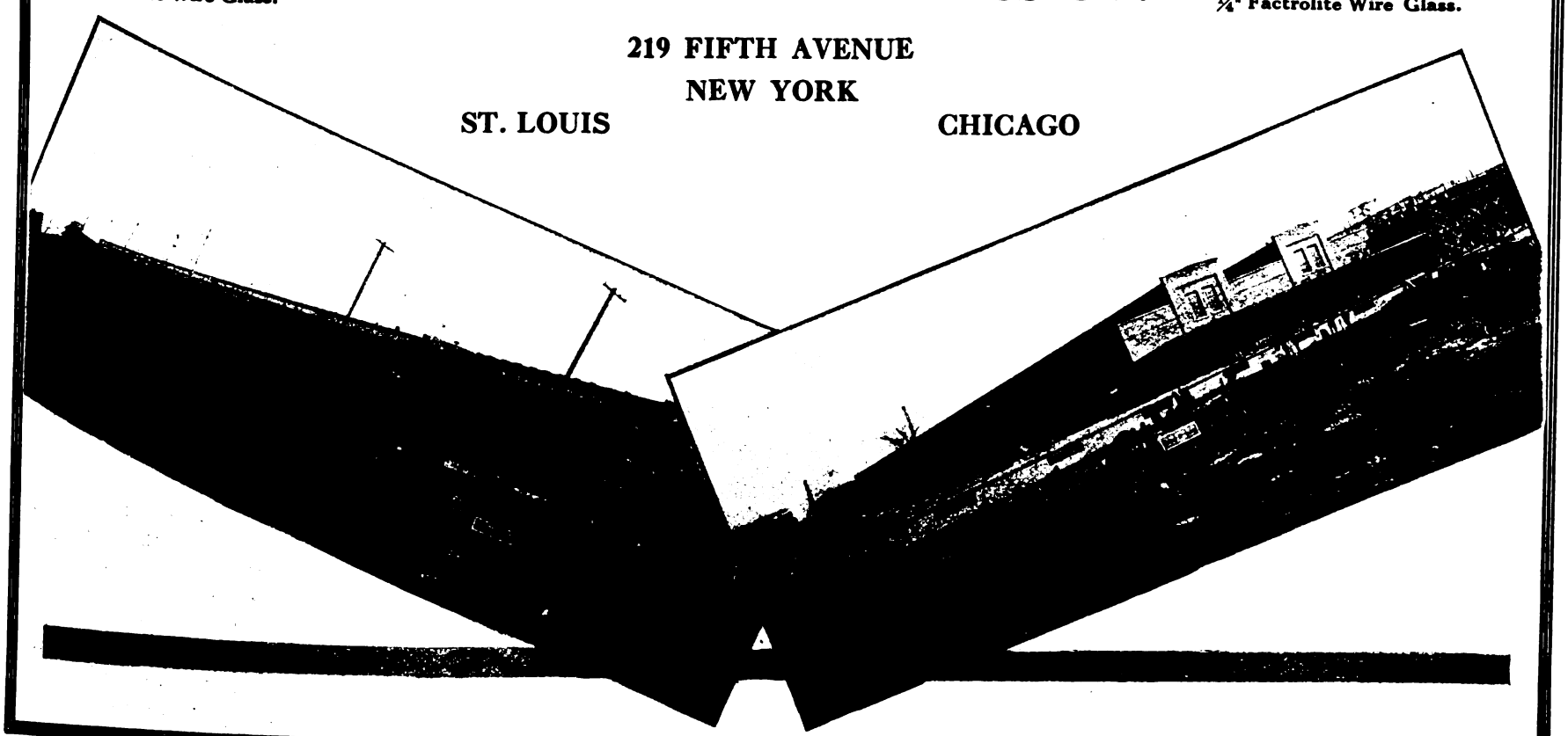
MISSISSIPPI GLASS CO.
MISSISSIPPI WIRE GLASS CO.

219 FIFTH AVENUE
NEW YORK

ST. LOUIS **CHICAGO**

Dunlop Tire & Rubber Corporation of America at Buffalo, N. Y. ⅛" Factrolite, ¼" Factrolite Wire Glass.

Dunlop Tire & Rubber Corporation of America, Buffalo, N. Y. ⅛" Factrolite Glass, ¼" Factrolite Wire Glass.



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(*Continued from Page 50*)

out after a severe slump in the price of cotton and when it looked as though everything were going to pot, was surprisingly productive of good results, not only in its immediate effects upon our collections, but in the responsive attitude it created on the part of debtors towards our Collection Department for the rest of the season.

"The replies it elicited, if they could be gotten together, would make an interesting study in psychology. A number referred to the letter as an 'irresistible appeal,' some thanked us for our 'sympathetic attitude,' while others spoke of it as 'cheering.' A more critical recipient, pinning to the letter a substantial check, wrote across it: 'There are others more entitled to my consideration at this time, but for your good-natured cozening I am going to award you something more useful than the proverbial brown derby, the fur-lined mess kit or the knitted umbrella.' "

Economy Shoe Store,
Prosperity,
Georgia.

Gentlemen:

Irvin Cobb, inimitable story teller, in a recent lecture, told of a globe trotter who was complaining of his lot because he had "been every where and seen everything" and there were no new worlds for him to conquer.

A seedy-looking individual, in the mellow and ingratiating stages of a delightful jag, here butted into the conversation:

"You shay you've been ever'-where?"

"Just about."

"Sheen ever' thing?"

"About everything of interest. Why?"

"Ever had delirium tremens?"

"C-e-r-t-a-i-n-l-y NOT."

"Well, all I gotta say is you ain't been nowheres and you ain't seen nothin'."

If our forefathers who passed through the fiery ordeal of reconstruction days following the civil war could hear some of our doleful forebodings and see some of the faces we are making, they would probably put us to shame by reminding us that as compared with the difficulties of those days our present ones are "as tarts to cheese-cakes."

The situation can be greatly eased by a bit of helpful cooperation all around; the load may be then distributed.

By helping us you make it possible for us to help others, and so the world moves on. We have obligations confronting us. Will you give us a bit of a lift by the 10th prox?

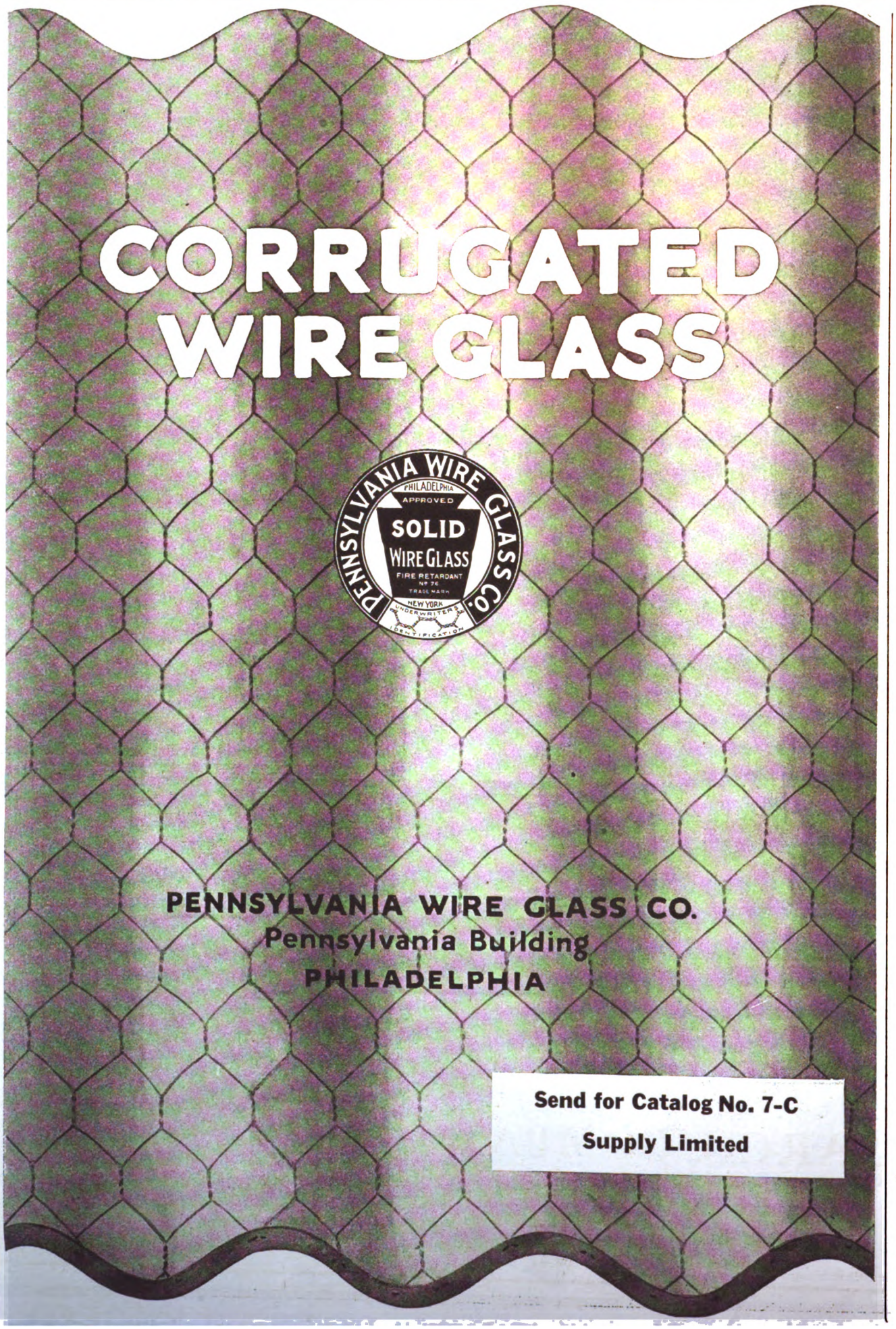
A statement is enclosed. We thank you in advance.

Cordially yours,

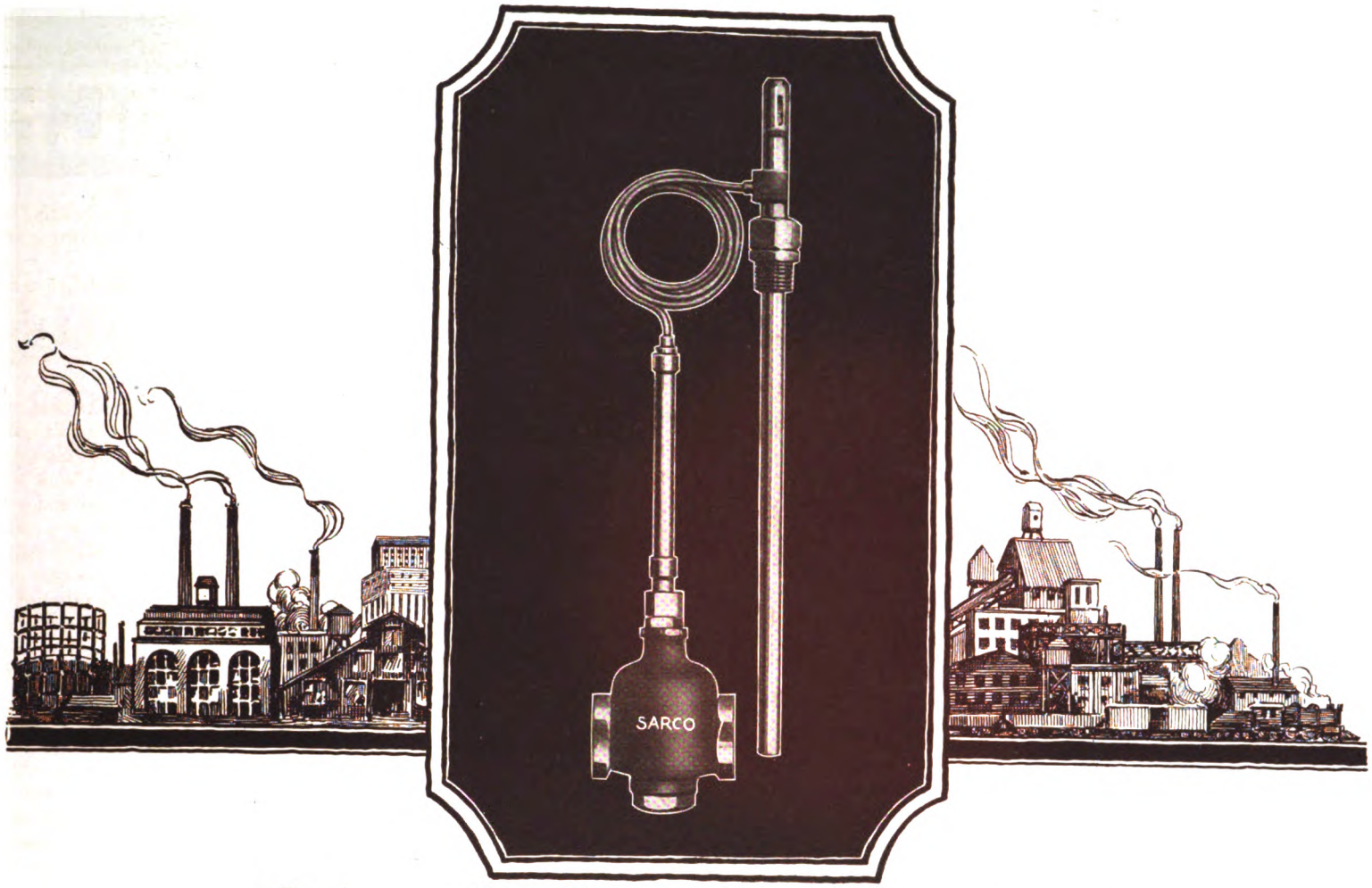
Spencer C. Gunn, Credit Manager of the A. P. W. Paper Company, Albany, N. Y., believes that we should spend some of our energy in making good collection letters unnecessary. He believes that the best collection letter is a letter from one of your own salesmen, taking a first order and stating that the customer will send acceptance on receipt of bill. Here are some of his views expressed in his own words on this subject.

"When, after we had dodged and whacked mosquitoes from the time Adam and Eve began the battle alone and, from all accounts, rather fully exposed to their assaults, some one—was it J. D.?—proposed to go at the thing the other way about and can them with an oil can, how impossible, how ridiculous even, such a scheme at first seemed. But the plan was correct in theory and it was only a matter of its practical application. Now we know that although we will, no doubt, always have some mos-

(*Continued on Page 55*)



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The Self-Contained Heat Regulator

Thermometers will tell you when the temperature is just right; they will also tell you when it is too low or too high—but they can't *do* anything to it.

Room temperatures—drying ovens—mixing vats—do you keep them at the correct temperature, all the time, day in and day out? Are your sprinkler tanks maintained always just above freezing in winter; or are you wasting steam unnecessarily; or risking freezing through insufficient heat? Wherever artificial temperature must be held within safe limits

SARCO

Temperature Regulator

sits on the job, day in and day out, year after year, never allowing a variation from the exactly right point. There are no "auxiliaries" needed to help SARCO do its work—no electric power or compressed air—no complicated connections or attachments. SARCO requires only to be coupled up to the supply line; once set, whether the required temperature be 32° or 320°, SARCO asks only to be left alone.

May We Send Booklet R-66 Now?

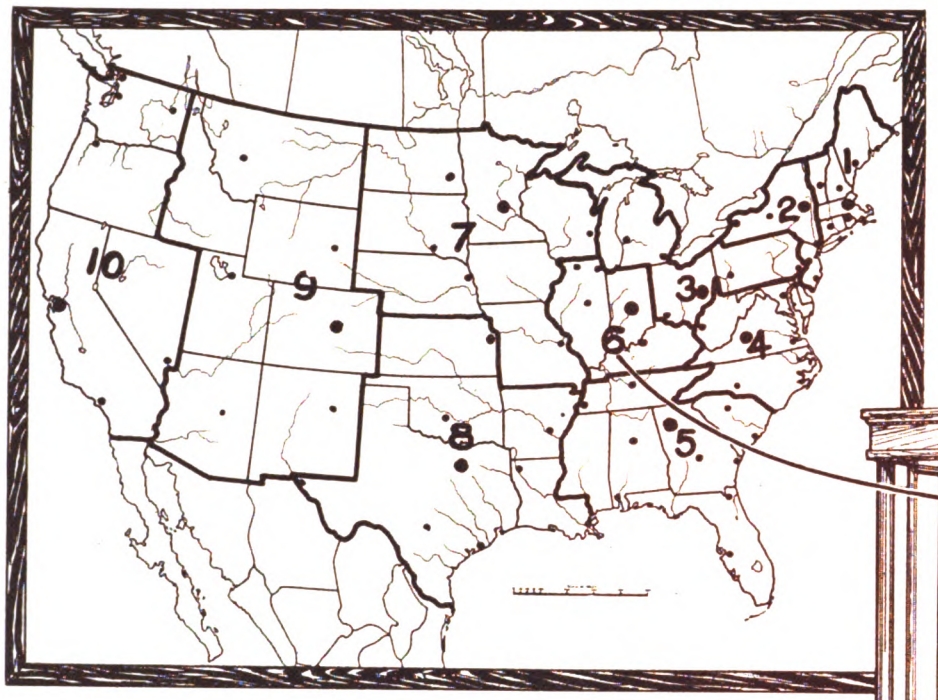
SARCO COMPANY, Inc.

233 Broadway, New York City

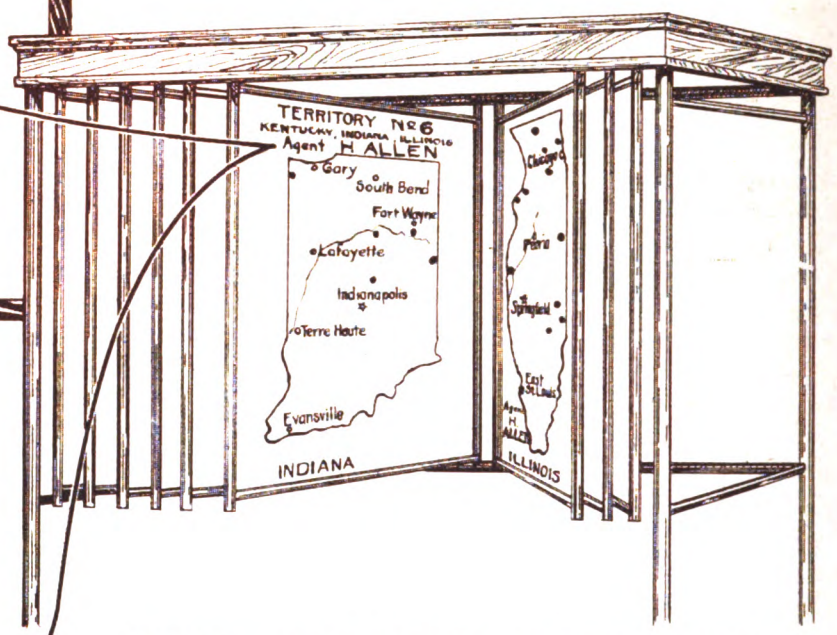
PHILADELPHIA, PA. CLEVELAND, O. BUFFALO, N. Y. DETROIT, MICH. CHICAGO, ILL.

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YOU MUST SELL BEFORE YOU PRODUCE



A COMPLETE Graphic Sales Control SYSTEM IS NECESSARY FOR INTELLIGENT SELLING

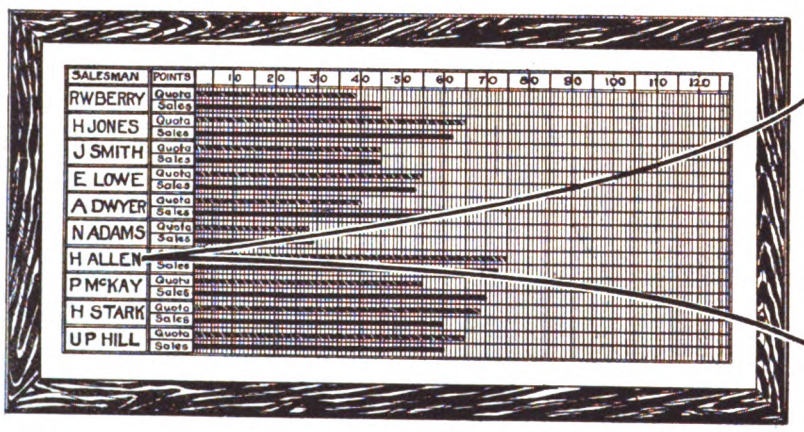


THIS MASTER SALES MAP

Is marked off with cords and pins to show the sales manager where each territory lies, where each agency is located and where the division manager is.

THESE DETAILED SALES MAPS

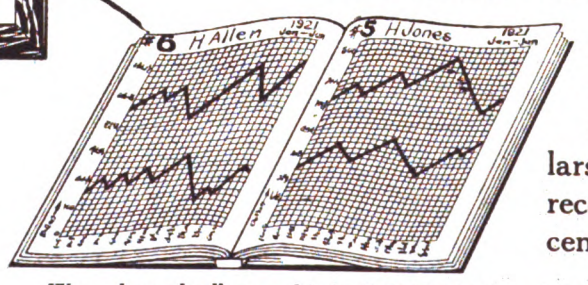
Show locations of customers and inquiries. Every detail of each man's territory is shown by map pins on large scale maps mounted on cork filled leaves. These are for quick reference in handling correspondence and referring customers to the right Division Manager or jobber.



THIS SALES QUOTA CHART

This Mechanical Bar Chart shows each division manager where he stands as compared to the others and his own quota. Each day his tape is advanced, corresponding to his sales so far this month. Each Division Manager also has a similar chart showing each of his salesmen how they stand.

THIS SALES CHART BOOK



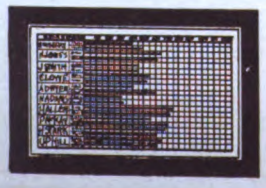
Has letter sheet size charts of each man's record of sales by dollars or tons, also expense records per sale and in percentage.

We make and sell every kind of EDEXCO material for Graphic Sales and Production Control and can supply everything from map pins and charting paper up to the complete control systems.

Send for analysis blank so we can quote you intelligently on graphic control equipment for either your sales or production. Specify which blank you desire.

CATALOGS OF SUPPLIES FREE

Trial Kit of Small Supplies, Pins, Chart Papers, Map Mount, and EDEXCO Primer of Graphics **$1.00**



THIS PHOTOSTAT

of the Quota Chart is mailed to the Division Manager weekly so he can see himself as he is seen at headquarters.

EDUCATIONAL EXHIBITION CO., 427 CUSTOM HOUSE STREET PROVIDENCE, R. I.

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(Continued from Page 52)

quitoes, we need never have any more than we are willing to tolerate.

"Why not, in this age of Prevention, apply the same method to overdue accounts which annoy and irritate and which breed in the stagnant pools and dark hollows of insincerity, misunderstanding and bad business habits? Why not treat every new account as a possible incubator of statements, dunning letters, cold legal demands, lawsuits, losses and all the train of expense and ill will that so often follows an account which is really only half opened and apply at the beginning the antiseptic treatment of a frank understanding? And why not reopen accounts that should have been opened in this way?

"Of course, if you start out with the idea that all customers are absolutely alike in their ability to pay and that each one can take care of a large bill just as readily as a small one and is always in the same good condition as regards his bank account, you are not going to get very far. That does not mean, however, that you should give 30 days here and 60 days there and 90 elsewhere on open terms.

"But, while you are getting your customer, if possible, to use his bank credit to properly finance himself, if and when he needs it, and build up a deserved reputation for observing regular terms of sale and also taking such discounts as are offered, why not give him such time as he has legitimate need of upon a basis fair to you and your other customers, such as a note with interest at maturity for the needed overtime or, better, if your customer knows he is going to require extra time, a trade acceptance with invoice, with interest included after the expiration of the regular net time allowance? If you don't get a note or acceptance you usually secure a better observance of your regular terms and you always dispel the notion that terms do not mean anything.

"Difficult? Well, nothing worth while is ever easy. Impossible? No, nor even in my opinion impracticable. We have been working along these lines for some time with considerable success. A matter of education, admittedly, for your salesmen as well as your customers. But if the idea is sound, as I believe it is, it will appeal to your salesmen and they will help you to sell it to your customers who will be benefited as well.

"And where they don't sell it and you don't? Well, there is no reason why you should take a first refusal in selling terms any more than in selling goods. And if, here and there, a buyer simply won't buy your goods and observe any terms whatever, regular or otherwise, won't you be just as well off—and possibly better—to leave him for someone else and look around the corner for a customer who *Will?*"

E. G. Leihy, Credit Manager of the Blumauer-Frank Drug Company, Portland, Ore., does not use form letters for collection purposes but dictates each letter individually, making a specific effort to cover each individual case. "Most of our letters," says Mr. Leihy, "are written to what might be called carried accounts, and as such would not lend themselves freely to form letter treatment. Here is a form letter, however, which I have selected from the data accumulated for reference purposes and which, although I can claim no part in its composition and do not know just where it came from, appears to cover the general situation quite well."

Dear Sir:

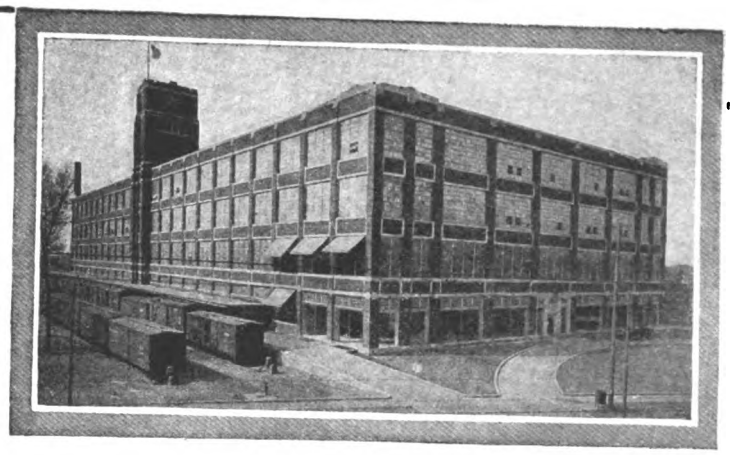
We have had no response from you to two statements of your account amounting to $..... that is now some little past due, the first statement mailed at maturity and the second a short period thereafter.

We are disappointed that your prompt remittance of the due account was not made. This may have occurred through some neglect of the statement of your failure to note the due date of our account.

The sale and purchase of merchandise is a reciprocal arrangement. The buyer expects to make a profit on the prices charged him for the merchandise, and the seller anticipates also the making of a reasonable profit from the prices charged, and bases these expectations to no little degree upon the sales terms being complied with.

Failure to carry out either side in this reciprocal arrange-

Assembly Plant of The Willys-Overland Company, St. Paul, Minnesota, designed by "MRBN" Engineers



Do You Appreciate the Value of a Good Plant?

THE modern industrial plant, equipped with suitable mechanical handling machinery, is rapidly supplanting the old-time sheds used for manufacturing purposes, just as old organization methods have given way to modern industrial management.

A competent organization cannot make a good product economically in an old, poorly designed group of buildings, built without sufficient light or ventilation and not properly suited to the particular needs of the business it serves.

While you are getting your house in order by a rehabilitation of organization and methods to prepare for the new era of lower costs and keener competition, do not overlook the important part played in the success of any manufacturing enterprise by the plant. A building or group of buildings designed to fit *your* operations, will prove to be an economy of the lasting kind and will pay dividends as long as your plant is in operation. Whether you are going to build a new plant or remodel your present one, an intelligent analysis will determine what will best meet your conditions.

Thirty years experience by "MRBN" Engineers in the layout and design of plants for others is at your service for the design of a new plant or extensions, or recommendations for plant improvements. If you are planning improvements, we suggest that you write for one of our engineers to consult with you without obligation on your part.

THIRTY YEARS
MRBN
OF
INDUSTRIAL
PLANT
LOCATION
LAYOUT
DESIGN
EQUIPMENT

Send for Booklet

Every Industrial plant owner contemplating new buildings can find useful plans, details and illustrations of modern industrial plants in our booklet, "Industrial Buildings," sent free on request.

Mills, Rhines, Bellman & Nordhoff
ENGINEERS
TOLEDO
SUPERIOR AT MADISON
PHONE ADAMS 1679

"DESIGNERS OF BETTER INDUSTRIAL PLANTS"

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ment is a neglect of the contract and works to the disadvantage of the other party. I do not know that you have recognized this, but when the merchandise was bought and upon specified terms, and delivery was made at the prices on the agreed terms, then contract arrangement was effected, and loss must occur if any important feature of the arrangement is not fulfilled.

We are sure you want to buy our goods, to the very best advantage, and that you would not intentionally violate a contract. Realizing that we desire to give you the very best within our powers but depend in doing so on the close observance by our customers of sales terms, I am sure you will not only respond immediately with check for the overdue account, but favor us in the future with prompt settlements of accounts.

We feel that we can depend upon your prompt response.

Yours very truly,

Carl F. Miller, Credit Manager of the Sanitary Food Manufacturing Company, St. Paul, Minn., believes that the underlying principle of a collection letter must be of the sales point of view. "It must be constructive," says Mr. Miller.

"It is assumed that the psychology of the delinquent has been analyzed, and the human element or the appeal to good will and pride should be emphasized.

"CREDIT is a COMMODITY. Sell it to your customers.

"I am of the opinion this letter contains all of the elements necessary in a good collection letter, namely: Secures attention, suggests and secures action, maintains respect, shows fairness, employs surprise and impulse.

"It will also be noted the letter is not written in any manner that will show anger.

"Letters should be concise, crisp, and in a word, human little talks to debtors that arouse their interest, get checks instead of promises and changes the ? mark of doubt into the $ mark of certainty. They make a man admit, Yes, they're right, that account is past due, it ought to be paid. You know most debtors feel they must make good, and they do. They all like to be regarded as square and honest, and it's surprising what they will do to live up to your estimation."

We are unwilling to assume that the above account is being neglected by you, or that you are intentionally putting off the date of payment.

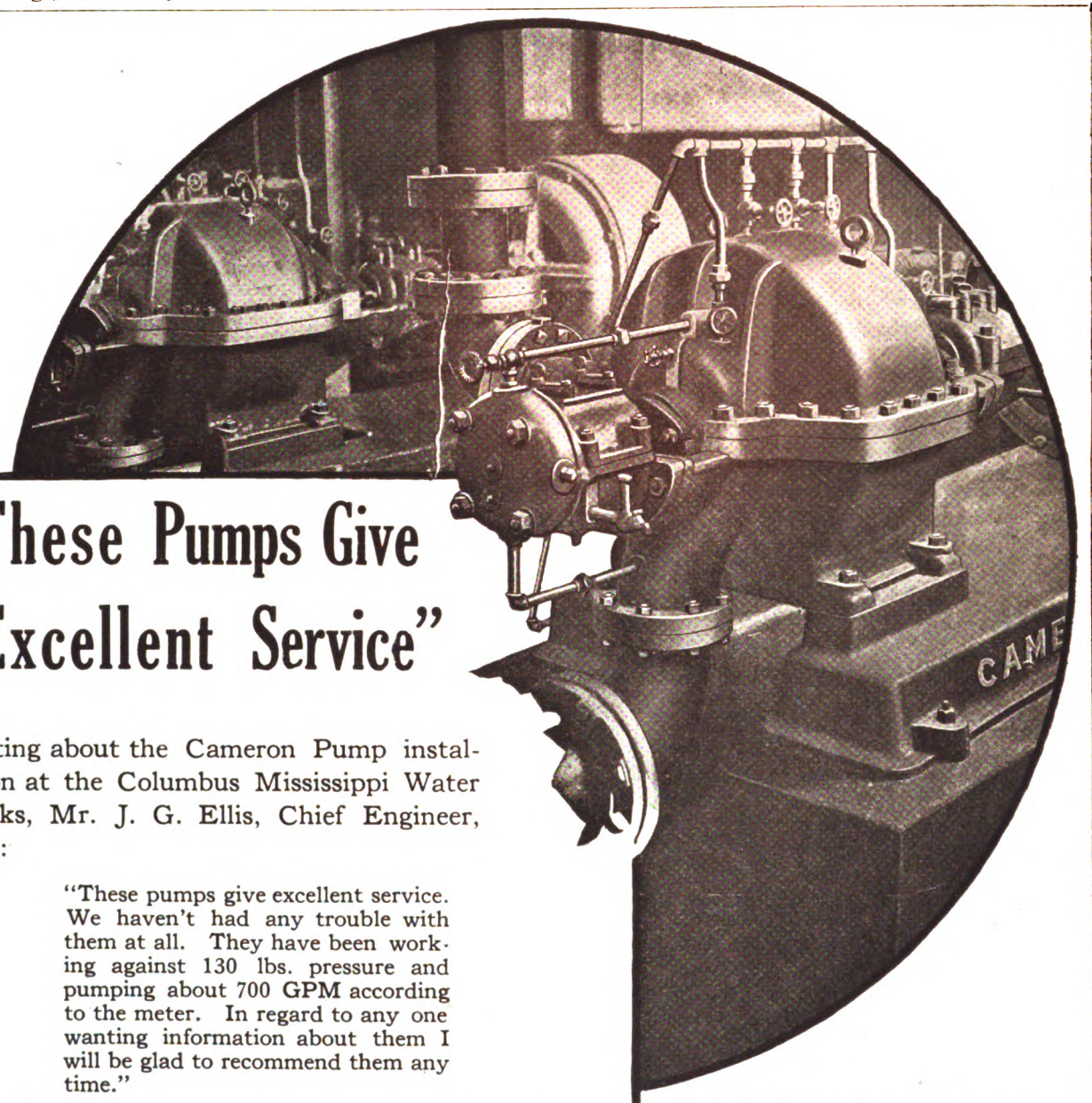
Naturally, Mr.——— (gentlemen), we have a high regard for yourself, (for your good company), and have greatly valued our business associations with you. Anything which would tend to interrupt even temporarily the pleasantness of that association would be a matter of sincere regret to us. We believe that the association is one which undoubtedly will result to our mutual profit, and we are very anxious to see the volume of business between us increased.

However, you do not expect us to be satisfied with the present condition of your account. You have delayed for a long time making payment of the amount due. We are frank to state that this condition is not altogether pleasing to us, and we do not think that it is any more pleasing to you. An unpaid past-due account is as apt to breed friction as any one thing that we know of, and we do not wish any friction whatever between our good customers and ourselves.

We have been doing our best to eliminate any possible cause of misunderstanding by carrying your account for a long time after it became due. Surely you do not expect us to continue to do so. The next move should be made by you.

We are, therefore, looking forward to finding a check attached to your next letter and

(Continued on Page 58)



"These Pumps Give Excellent Service"

Writing about the Cameron Pump installation at the Columbus Mississippi Water Works, Mr. J. G. Ellis, Chief Engineer, says:

> "These pumps give excellent service. We haven't had any trouble with them at all. They have been working against 130 lbs. pressure and pumping about 700 GPM according to the meter. In regard to any one wanting information about them I will be glad to recommend them any time."

Mr. Ellis is satisfied with Cameron service—and more—*he is willing to recommend these Pumps to others*. His statement echoes the sentiment of many engineers who know from experience that Cameron Pumps can be depended upon.

Write for Bulletin 7351

Ingersoll-Rand Company

General Offices: 11 Broadway, New York

Offices Everywhere

134-DV

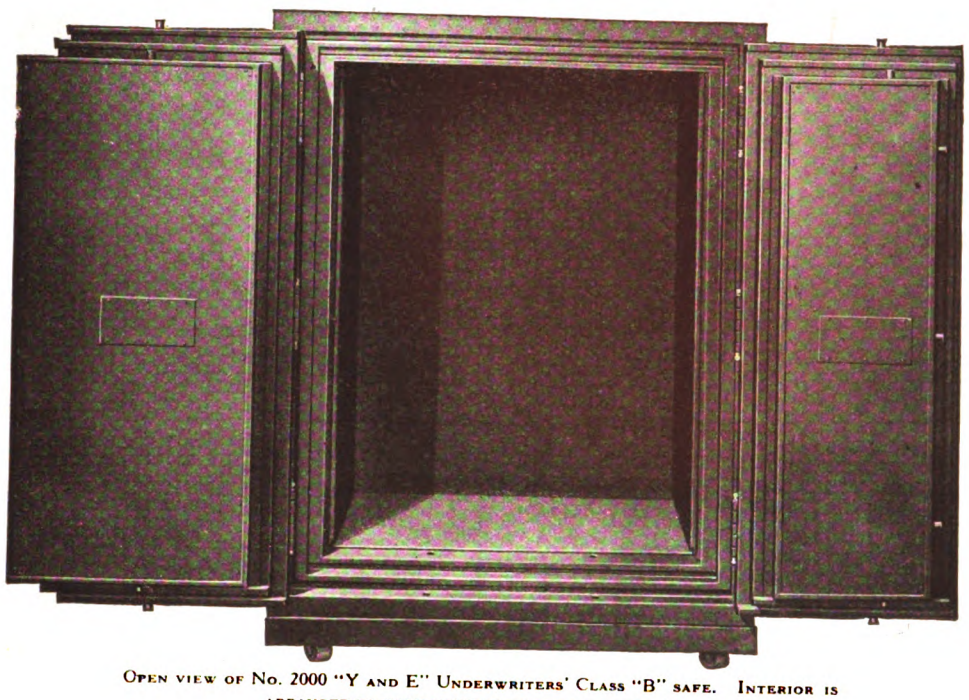
Two No. 5 Class MT 3-stage Cameron Pumps located at the pumping plant of the Columbus Mississippi Water Works

PRICE · OIL ENGINES

Ingersoll-Rand

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At Last!
A Dry Insulated Safe!



OPEN VIEW OF No. 2000 "Y AND E" UNDERWRITERS' CLASS "B" SAFE. INTERIOR IS ARRANGED TO TAKE STANDARD HORIZONTAL SECTIONS

THERE have been fire-resisting safes—of varying degrees of efficiency—in the past But they all depended on moist insulation. And moist insulation inevitably causes deterioration with the passage of time: because moisture evaporates, and causes rust and consequent weakening of the walls.

"Y and E" succeeded, in February of this year, in winning the Class B label of the National Board of Fire Underwriters with a *dry insulated* safe which insures

PERMANENT PROTECTION
FOR
Permanent Records

To win this Class B Label, the "Y and E" Dry Insulated Safe had to pass gruelling tests that no safe in actual use would be likely to encounter. Placed in a special furnace for two hours at a temperature of 1,800° Fahrenheit—dropped (while red hot) a distance of thirty feet onto a pile of broken stone and debris—returned, bottom-up to the furnace for another hour—yet, the doors did not buckle, and the contents were unharmed.

Write us today for our new safe booklet, "Permanent Protection for Permanent Records"

YAWMAN AND ERBE MFG. CO.

Filing System Service, Equipment and Supplies

Rochester, N. Y.

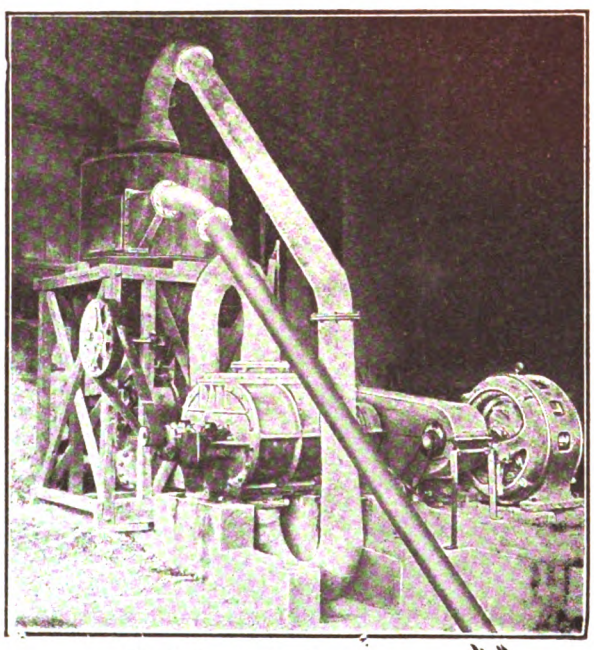
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The AIRVEYOR

Room 806—140 Cedar Street, New York

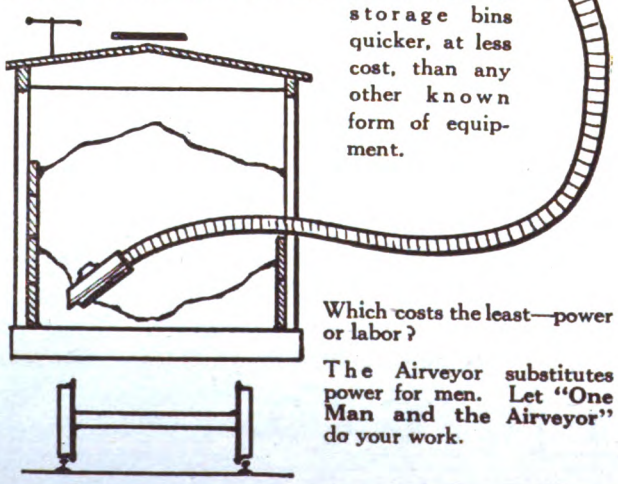


Pulling It Out at 30 Tons Per Hour



The Drive of the Airveyor

"One Man and the Airveyor" will unload pulverized material from cars and deliver it to the storage bins quicker, at less cost, than any other known form of equipment.



Which costs the least—power or labor?

The Airveyor substitutes power for men. Let "One Man and the Airveyor" do your work.

THE AIRVEYOR

Saves Time, Saves Money, Saves Men

DUSTLESS—NOISELESS—SAFE

Write for Bulletin No. 126, describing installations for handling soda ash, lime, grain, sawdust, fertilizer and other pulverized or granular materials.

(*Continued from Page 56*)

we shall expect that letter within the next three or four days.

Yours very truly,

While the exhibition of "best" collection letters is going on, we cannot resist the temptation to show one of our own which was originated by F. W. Bope, Sales Manager of The Engineering Magazine Company. Strange as it may seem, the publishers of technical and industrial papers occasionally need to use collection letters, and this one of Mr. Bope's has "brought home the bacon" in a number of cases.

Mr. A. E. Smith,
Buffalo,
New York.

Dear Mr. Smith:

The other day the company treasurer told me that he liked immensely the courteous and patient tone which we are trying to get into all our letters to our good subscriber-friends whose payments are overdue.

"But," he continued, "I am wondering if while keeping your letters human and all that, you could not, at the same time, put into them something which will inspire a quicker response.

"Here, for instance, are a few perfectly good accounts which I have just picked out from the pile of outgoing mail on the billing clerk's desk, as being worthy of a special letter. Try your hand at it, and report to me in ten days on the results."

After cudgeling my brain over what to say to these A1, gilt-edged, thoroughly dependable credit risks who had undoubtedly just overlooked my previous letters, I have come to the conclusion *that all You need* (for you are one of them) *is a straight-f r o m-the-shoulder request for payment.*

So here it is. Do I win?

Yours very truly,

Making Sales Statistics Talk

(*Continued from Page 21*)

Graphic charts such as are shown in Figures 5, 6 and 7, are unusually effective in stimulating Persistence in sales competitions. They provide this stimulant by bringing home vividly to each salesman the spirit of competition which exists in those worth while; combined with a means of recording results that helps to turn the work into play. There are so many chances for variety that the story never grows old for the sales manager can draw from the field of baseball, foot ball, sixday bicycle races, golf, track events, and even poker if need be!

There is sound business psychology back of this plan of stimulating Persistence. The old school salesmen will ridicule the idea. It is interesting to note that, however, where such plans have been introduced it is not many weeks before the old timers as well as the younger generation are observed earnestly studying the charts and striving to keep their records above par.

And, after all, the more that the spirit of play, honest competition and interest in the score are brought into business and industry, the more interesting will industry and business become to those who like to "play the game."

Following is a list of those who assisted us by supplying photographs for this issue:

Alvey Manufacturing Co.
Animated Picture Products Co.
Barber-Greene Co.
R. H. Beaumont Co.
Brown Portable Conveying Machinery Co.
Cutler-Hammer Co.
Electric Storage Battery Co.
Elwell-Parker Electric Co.
Federal Truck Co.
General Electric Co.
Gifford-Wood Co.
Girtanner Engineering Co.
Green Engineering Co.
Hayward Co.
C. W. Hunt Co.
Hires Turner Glass Co.
Lakewood Engineering Co.
Lewis-Shepard Co.
Louden Machinery Co.
Matthews Gravity Carrier Co.
Mergenthaler Linotype Co.
Portable Machinery Co.
Shepard Electric Co.
Society for Electrical Development
Trailer Mfrs. Assn. of America
Terminal Engineering Co.
Towmotor Co.
Uehling Instrument Co.
L. J. Wing Mfg. Co.

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Is Your Factory Running Upside Down?

THAT is not an absurd question. Up to a year or two ago, textile mill owners might have thought that it was. Now some of them know that it is a serious business—a grim matter of dollars-and-cents profit—a question involving greatly increased production in the same space at a lower cost.

Within the past few years a new principle has been developed which literally has turned textile mills upside down. Instead of preliminary processes starting on the ground floor—which has been the rule for generations—a scientific study of routing and conveying places these earlier processes on the top floor; the product progresses downward via mechanical conveyors in *a continuous stream.*

This steady, uninterrupted flow of materials through any plant, this shortest distance between the receiving and the shipping room, is a pathway of efficiency—of making the most money in the shortest time for all concerned—for labor, for owners, and for customers.

Perhaps your plant, factory, or business is partially or altogether upside down. Or it may be possible to revolutionize your production methods with Lamson Conveyors and not change the position of a single machine.

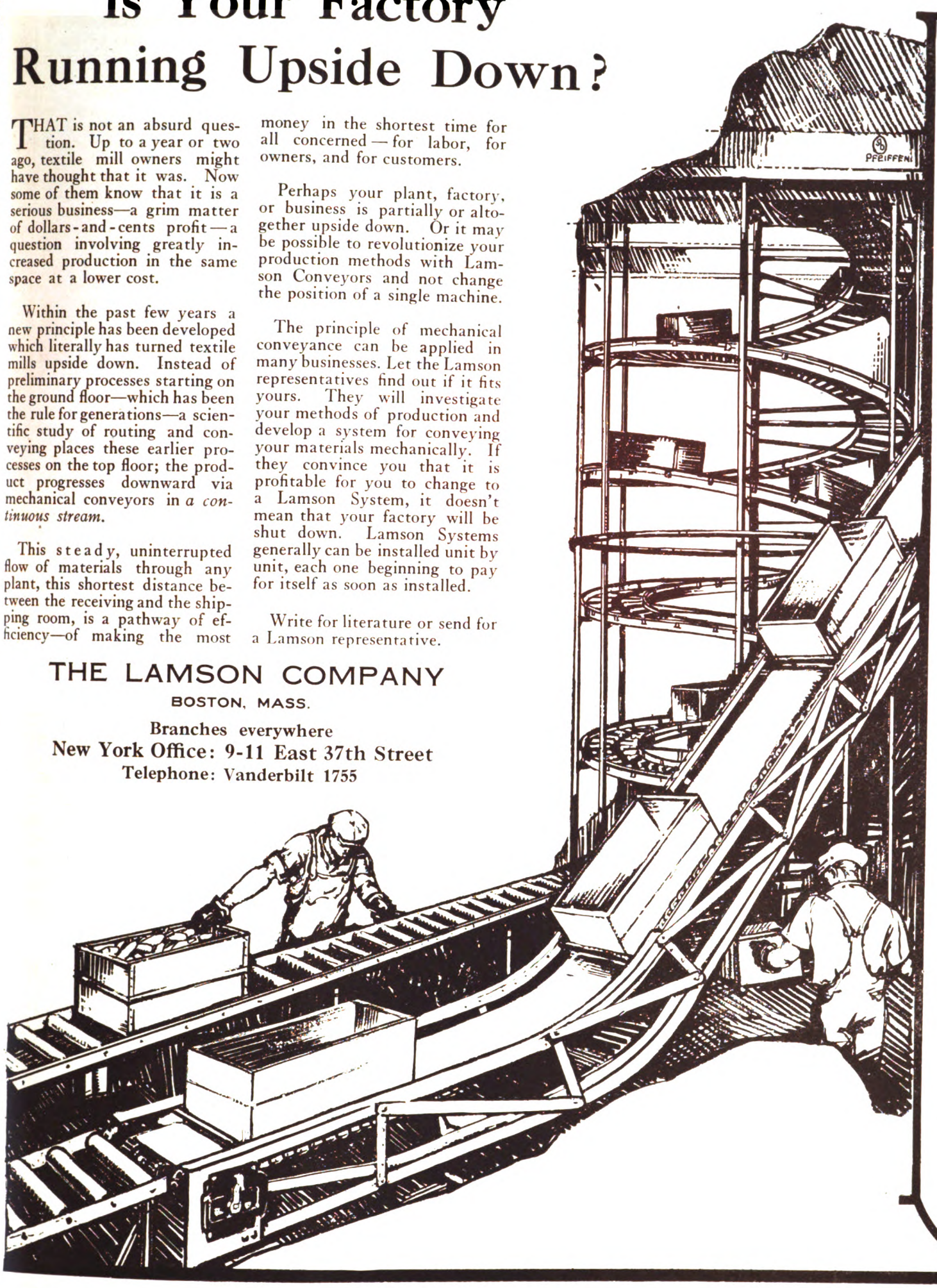
The principle of mechanical conveyance can be applied in many businesses. Let the Lamson representatives find out if it fits yours. They will investigate your methods of production and develop a system for conveying your materials mechanically. If they convince you that it is profitable for you to change to a Lamson System, it doesn't mean that your factory will be shut down. Lamson Systems generally can be installed unit by unit, each one beginning to pay for itself as soon as installed.

Write for literature or send for a Lamson representative.

THE LAMSON COMPANY

BOSTON, MASS.

Branches everywhere
New York Office: 9-11 East 37th Street
Telephone: Vanderbilt 1755



Is your business here?

Lamson Systems are being used successfully in the following industries. If yours is not here, perhaps it should be. Write to us.

Ammunition
Automotive Industries

Bakers Bankers
Book Binders
Book Manufacturers
Bottlers Brick and Tile
Box and Barrel Shops

Candy Manufacturers
Canners Chemicals
Chocolate Refiners
Cigar Manufacturers
Coffee Roasters
Cold Storage
Contractors Clothing
Cotton Spinners and Manufacturers
Crackers Cutlery

Dairies and Dairy Products
Department Stores
Drug Manufacturers
Drug Wholesalers
Docks

Electric Goods
Engravers

Express Companies
Factories
Felt Manufacturers
Flour Mills
Food Products
Foundries
Freight Houses
Fruit Packers
Furniture

Glassware Gloves
Groceries, Wholesale

Hardware Manufacturers
Hardware Wholesalers
Hat Manufacturers
Hay and Grain
Hospitals Hotel

Ice Cream
Jewelry

Knitting Mills

Laundries and Wet Wash Laundries
Libraries
Lumber Leather

Macaroni
Machinery Mail Order
Meat Packers
Metal Workers

Newspapers

Offices Optical Goods
Oil Refiners

Packing Paint
Paper Pianos
Plumbing Supplies
Post Offices
Preserving
Printers Publishers
Pulp Mills

Railroads
Restaurants
Rubber Goods

Seeds Shoes
Silk Mills Silversmiths
Soaps Spices
Sugar Refiners

Tailors Textiles
Tobacco Tea

Warehouses Watches
Wholesalers
Wood Pulp
Wood Workers
Woolen Mills

LAMSON SERVICE

Lamson Conveyors

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HUNT CONVEYOR

Conveys Coal, Ashes, Phosphate Rock, Cement Clinker and other similar bulk material with little attention, handling large tonnage at a very low maintenance and operating cost.

A RUGGED, RELIABLE MACHINE—GOOD FOR YEARS OF HARD SERVICE.

Catalogue G-20-2 fully describes the machine and contains detailed information helpful in adapting it to new or old Power Plants, Cement Mills, Coaling Stations, etc. Copy gladly sent to those interested.

C. W. HUNT CO., Inc.

Main Office and Works

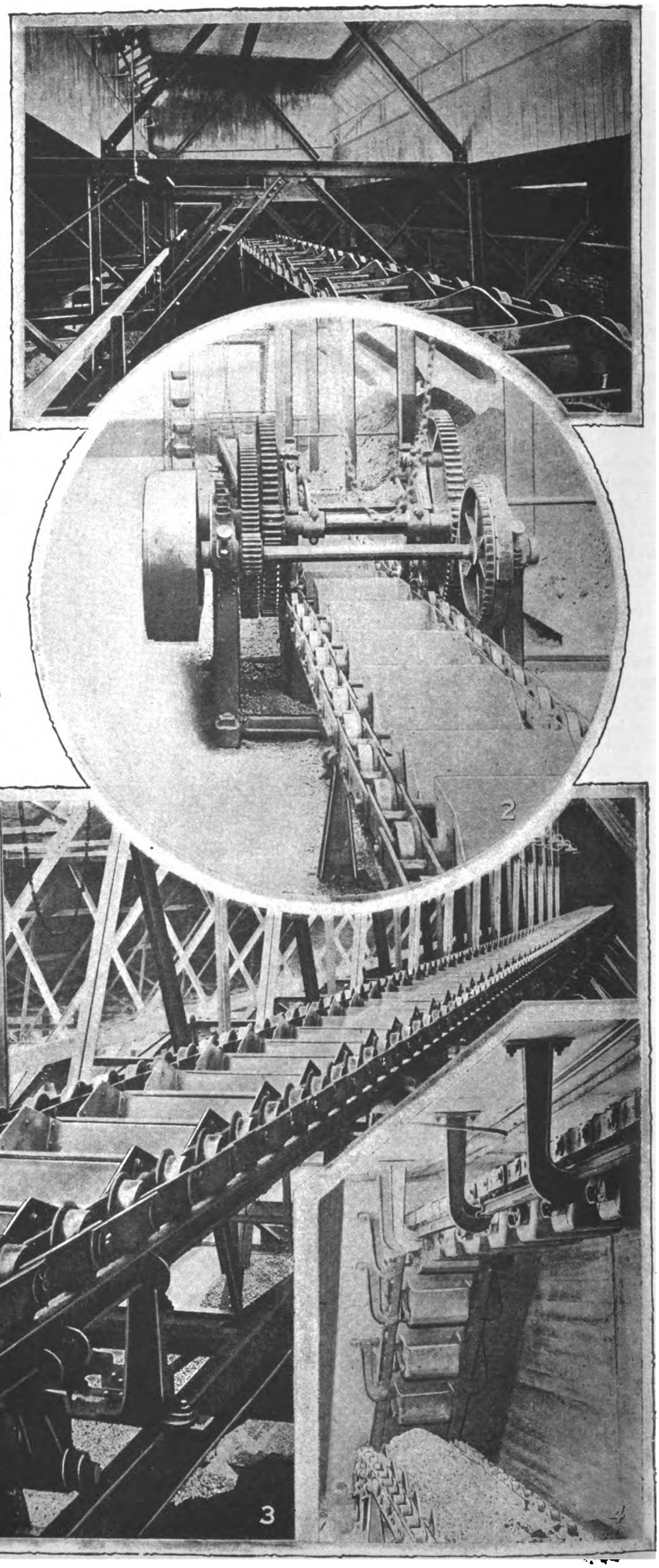
WEST NEW BRIGHTON, NEW YORK

C. W. Hunt Engineering Corp.
143 Liberty Street
New York City, N. Y.

Ernest F. Learned,
141 Milk Street
Boston 9, Massachusetts

Phillips, Lang & Co., Inc.
538 South Dearborn St.
Chicago, Illinois

James P. Mewshaw,
710 Fourteenth St., N. W.
Washington, D C



1 Pivoted bucket conveyor with cast iron buckets.
2. Hunt Pawl Driver which insures an even pull on conveyor chain at all times.
3. Conveyor with sheet steel buckets for handling coal installed in large Pumping Station.
4. Upper and lower run of conveyor with sheet steel buckets showing one of the many methods of supporting conveyor.

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Do You Know "How It Works"?

(*Continued from Page 28*)

The Linotype spaceband is composed of steel and consists of two main parts—the slide and the band. The slide, which is shaped somewhat like a Linotype matrix, tapers in thickness along its outer edges, from bottom to top, the top being considerably thicker than the bottom. The band, which is a longer, skeletonized device, tapers in thickness from top to bottom, the bottom being considerably thicker than the top. Thus, the two main parts of the spaceband, when properly meshed, are of the nature of co-operating wedges the outer edges of which remain in agreement regardless of the extent to which the band is raised.

When the key buttons of a keyboard are properly depressed, corresponding brass matrices are released from a magazine and are carried by a small leather belt to the assembling elevator. Every time the spaceband key is properly depressed, a steel spaceband is released from the spaceband box and drops into place in the line that is being assembled. An ingenious contrivance in the assembling elevator makes possible the assembling of either or both of two different faces from one font of two-leter matrices.

When a line of matrices and spacebands has been assembled, and the assembling elevator raised to the limit of its ascent, the line is carried to the left and lowered into position, in front of the mold in which the slug is to be formed. A justification block rises and by affecting the spacebands in the line, causes the line to be spread to the limits of its width. The metal pot moves forward until the mouth-piece of the pot comes in contact with the rear of the mold. Then the pot plunger descends and forces molten metal into the mold and against the inner edges of the assembled matrices and spacebands—and the slug is formed. The disk on which the mold is seated revolves to the left, and the bottom of the slug passes over a knife which trims the slug to the proper type height. Later the slug is ejected from the mold, and on its way to the receiving galley, passes between two knives which trim the slug to the proper point thickness.

When the first elevator reaches the limit of its ascent, and no recast is to be made, the matrices are transferred to the second elevator and raised to the top of the machine, and the spacebands are returned to the spaceband box. From the second elevator the matrices are pushed into a distributor box, and later are transferred to a distributor bar along which they are carried until they reach their respective points of release immediately above their respective channels in a magazine.

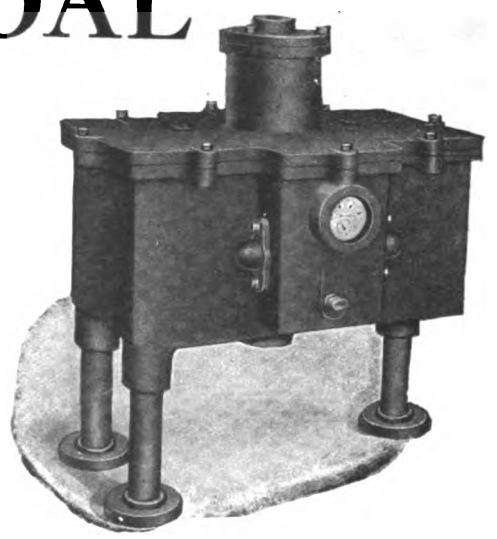
As many as three lines can be in movement at one time on the Linotype; that is, one line can be assembled while another is being cast, and still another is being distributed.

Linotype matrices and spacebands can be used over and over continuously. And a full font of the former and the regular complement of the latter provide a supply of matrices and spacebands ordinarily sufficient in quantity for even the fastest Linotype operators.

Perhaps no one thing has been so valuable in the spreading of enlightenment throughout the world as the Linotype, because the Linotype has made possible the publication of every sort of literature, and cheapened its price to an extent undreamed of a half century ago. Linotype matrices now may be had for forty different languages, and American-built Linotypes are in use in sixty-three different countries.

Little difficulty is encountered in teaching the natives of any section to operate and look after the Linotype. The natural ingenuity of the Eastern races enables them to learn the running of the machine with ease. And the moisture and heat of tropical countries are not serious handicaps in the use of Linotypes. At the equator, with an average humidity of nearly ninety per cent, Linotypes are running to advantage and with no greater amount of care than

To Help You Save COAL



Mason Condensation Meter, for measuring the quantity of condensed steam by actual displacement. Especially valuable in determining production costs accurately, and in checking waste.

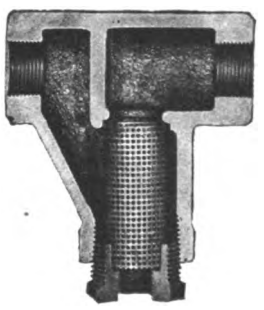
THE three appliances shown here, all meet the imperative need of today—the need for Fuel Conservation. Not alone do they save Coal, but they save **enough coal to pay for themselves** and to yield a considerable profit in addition. **"AN INVESTMENT NOT AN EXPENSE."**

That is why they are of special interest in this period of general retrenchment.

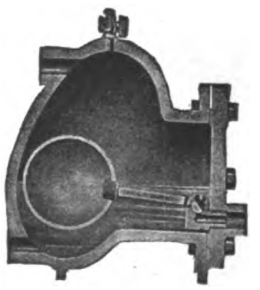
If you are interested in maintaining the greatest possible economy in connection with your steam lines, fill out the coupon: it will not obligate you, nor will it bring you the annoyance of an importunate salesman.

Plant Engineering & Equipment Co., Inc.

192 Broadway
New York City, U. S. A



The Peeco Strainer, which is applicable to service on steam or air lines—or as a separator on the steam line of boiler-feed pump; where it saves its cost many times over.



Corliss Valve Steam Trap, embodying the only valve which mechanically compensates for wear. Complete in six parts. Backed by a two-year guarantee.

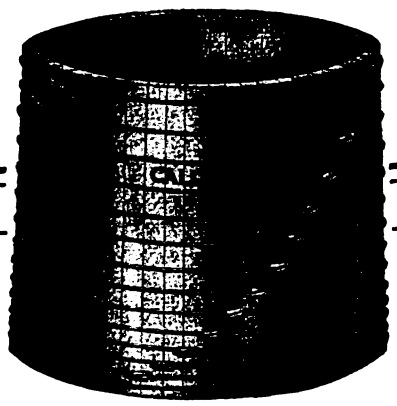
PLANT ENGINEERING & EQUIPMENT CO. BRANCHES

MASS.	Boston, 10 High Street
R. I.	Providence, 511 Westminster Street
CONN.	Bridgeport, 945 Main Street
N. Y.	Syracuse, 445 So. Warren St.
N. Y.	Watertown, 224 Factory Street
N. J.	Newark, 845 Broad Street
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LA.	New Orleans, Whitney Central Bldg.
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O.	Cincinnati, 3621 Columbia Ave.
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MO.	Kansas City, 312 Elmhurst Bldg.
NEB.	Omaha, 504 First Nat. Bank Bldg.
OKLA.	Tulsa, 425 Iowa Bldg.
COLO.	Denver, 932 Equitable Bldg.
CALIF.	San Francisco, 115 Mission St.
WASH.	Spokane, South 2818 Scott St.
VIRGIN I.	St. Thomas, Main Street
CAN.	Montreal, H. P. Ross, 190 St. James St
CUBA	Havana, Victor C. Mendoza.
HOLLAND	The Hague, Rubaak & Co.
FRANCE	Bordeaux, 53 Rue Boric

Save Money by Saving Steam By saving Coal.

Please address to Nearest Branch Office
Gentlemen: Please send me full information on:
( ) Steam Traps ( ) Pumps of all kinds
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It's the Knowing How

A POOR cook can spoil the most excellent food. It's the knowing how that determines its final quality.

Caldwell Cypress Tanks are finished products par excellent and backed by the "know-how" of over thirty years' experience. The fine materials of which they are made are not in themselves sufficient to give maximum strength, durability, and tightness. It is the training and thoroughness of expert and experienced tank builders that have established for all Caldwell Tanks their enviable reputation.

Write for Catalogue

W. E. CALDWELL COMPANY
INCORPORATED
2200 BROOK ST. LOUISVILLE, KY.

Caldwell
TANKS AND TOWERS

Now That You Have Seen It

HOW DO YOU LIKE

"Industry Illustrated?"

KNOWING FOR SURE, from seeing this issue, that it is going to serve you in large ways, you will want a copy coming to you every month, with its fascinating pictorial panorama of the swift advances in manufacturing and business methods and of the red-blooded personalities of the men who are doing big things, industrially.

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Send me INDUSTRY ILLUSTRATED every month for a year. I shall remit the subscription price on receipt of your bill.

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Annual subscription price, $1. In Canada, $1.25; in Foreign Countries, $1.50.

(AD-L)

that required in more temperate zones.

In Japan three English newspapers are produced and newspapers use the machines. India has over two hundred Linotypes, nearly all operated by natives, many of whom have only a slight knowledge of mechanical principles, and the English language. Linotypes are in use in Manaos, Brazil, a thousand miles from the mouth of the Amazon River; in La Paz, Bolivia, more than 13,000 feet above sea level; and in every other city of importance in South America, including Punta Arenas, the most southerly inhabited town in the world; in a number of cities in Alaska; in the Philippine Islands; in the Hawaiian Islands; in the West Indies; in Fiji; in the Malay peninsula; in many cities in Siberia; in the principal cities of both North and South Africa; in Nairoba, British East Africa, the heart of the "big game" country. Six of the machines are in operation in the Vatican, at Rome; thirteen of the battleships of the United States Navy have Linotypes on board, and Linotypes are used by the government printing offices of more than forty countries.

The average yearly output of the more than forty-two thousand Linotypes manufactured could produce four thousand books in one day. It would be difficult to calculate how many of the Fourteenth Century scribes would be necessary, to produce this amount of work. Perhaps, after all, the "good old days of yore" had their drawbacks.

Passing of the Roustabout

(*Continued from Page 24*)

and the old method side by side. These drums weigh 500 lbs. each. To put the skids in place, block them, and roll the drums up into the truck, takes time; not only time, but a lot of valuable physical energy. On this job alone, the equipment pays dividends. But this same equipment handles a wide variety of other jobs in and about the plant—paying for itself many times over, and resulting in a lower price of the product to the consumer.

Again, on page 24, the crane and sling was a vast improvement over the roustabout gang for handling steel plates; but the electro-magnet results in a further saving, since it does away with the time and the extra labor of fastening the sling or chain. Here again, the equipment is not limited to a single use; the electro-magnet, in fact, saves an unbelievable amount in the handling of iron and steel scrap.

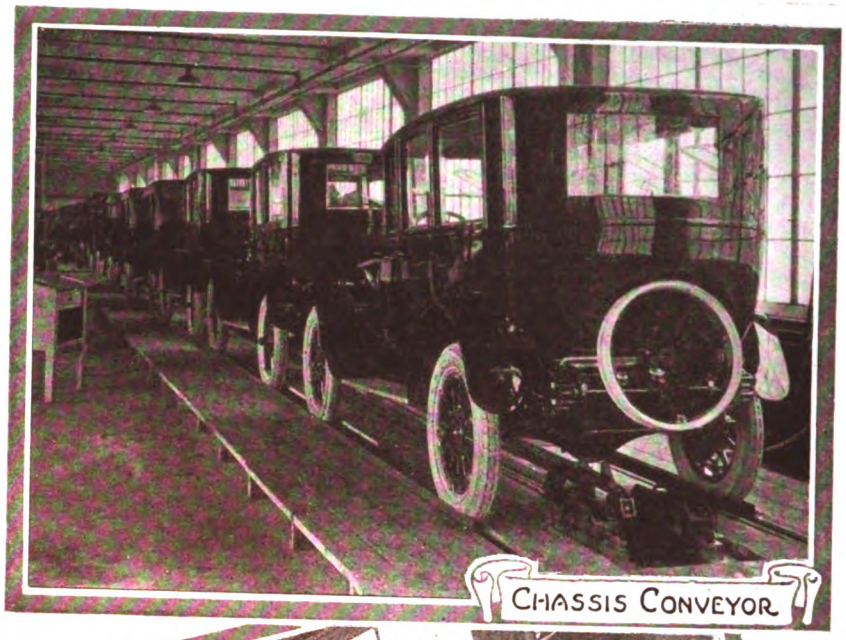
Just as the illustrations cannot begin to cover the subject fully, so these instances are merely a suggestion—scratching the surface, so to speak—of the tremendous accomplishments possible in the way of reducing the cost of handling. When we consider how much handling is inevitable between raw material and ultimate consumer, of any average product, it becomes plain that here lies at least a part of the solution to high prices.

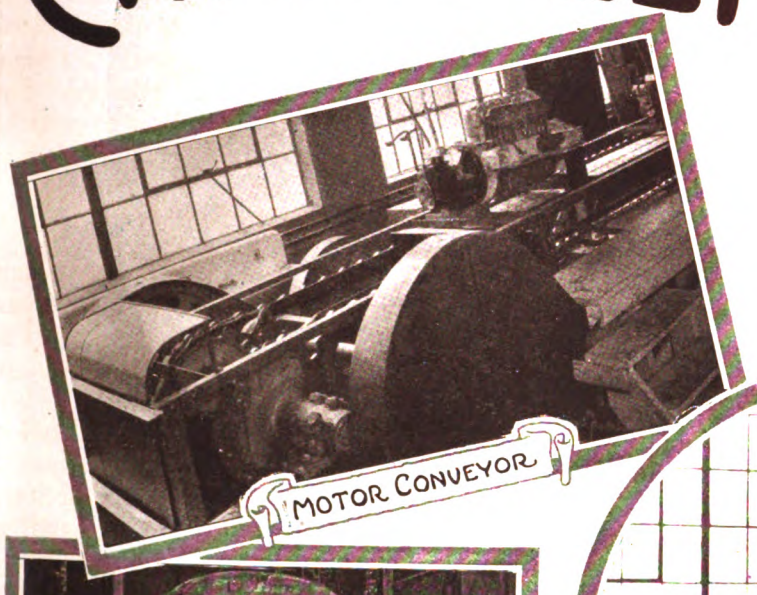
Meanwhile, what about the roustabout himself—where does he fit into the scheme of things? At first glance, it might seem that the mechanization of material handling would throw vast members of men out of work. Yet, time and again, this idea has been proved a fallacy. When machine-looms were introduced into the textile industry the cry went up that thousands of employees would be without means of livelihood; that each machine would throw a certain number of operatives out of employment. Instead, the introduction of machines actually made it necessary to employ *more* human labor than before, due to an increased production and to the widened market which resulted from lower production costs.

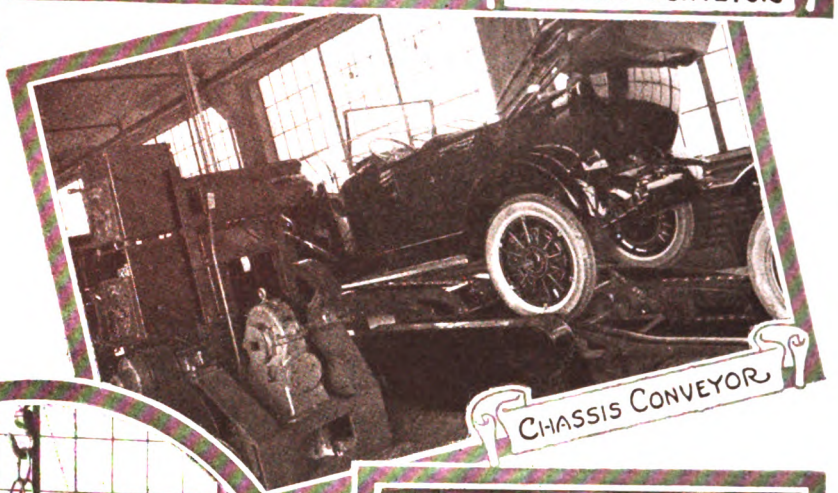
Just as in any other work where machines have multiplied human labor, the roustabout of good average mentality learns to handle the new machines. Probably all but a small fraction of the men will fall into this classification, and for them the introduction of mechanical methods will mean less hard physical work, better pay, and a higher standard of living. Which, in the final analysis, is what really constitutes industrial progress.

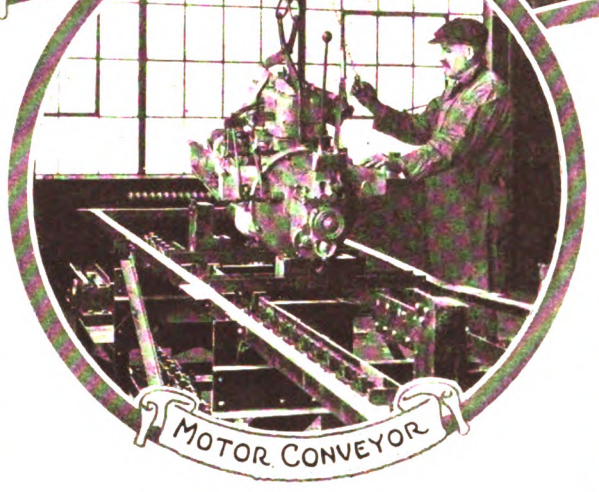
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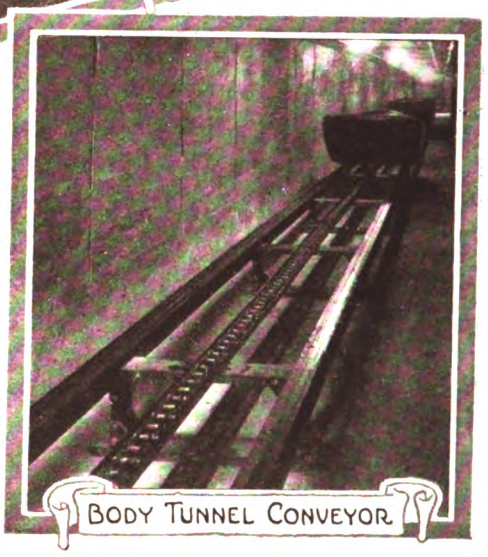
Behind the Scenes with CHANDLER

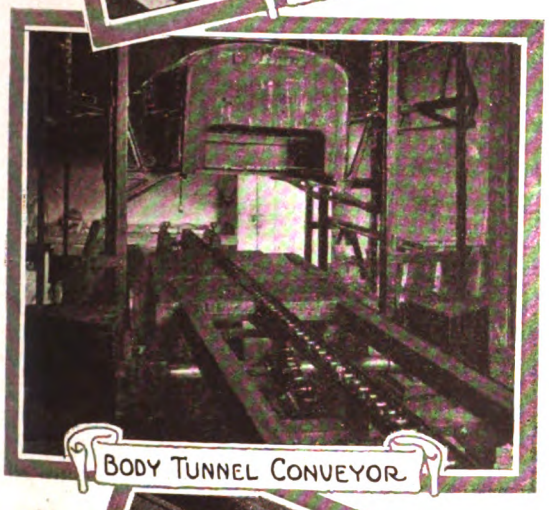

CHASSIS CONVEYOR


MOTOR CONVEYOR


CHASSIS CONVEYOR


MOTOR CONVEYOR


BODY TUNNEL CONVEYOR


BODY TUNNEL CONVEYOR


CHASSIS CONVEYOR

THE Chandler Motor Car Company is one of those firms who realize that a "buyers' strike" does not call for wailing and gnashing of teeth, but for *lower prices*. And lower prices are only possible through *increased production at less cost*.

The illustrations on this page give a graphic explanation of why Chandler has almost forgotten that there was a buyers' market. The increased production due to the conveyor system killed two birds with one stone; cut the factory-cost-per-car; and helped to meet the resultant demand for more cars.

This complete conveyor installation was designed and installed by

Gifford-Wood Co.

SECOND HILL HUDSON, N. Y.

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EXPORT - IMPORT - FINANCING

THE present exchange situation offers exceptional opportunities for American concerns of all kinds. We have exported from and imported into the United States tens of thousands of tons of raw products and finished goods. We are equipped by experience and fully organized to attend to all the details of your foreign trade requirements, including the financing of same. Our connections with leading banks in all important European countries enables us to attend to remittances in all exchanges and to the cashing of coupons. We are in a position to advise you, both on the market for exports and on the materials and products which can be imported to advantage.

Northern & Western Finance & Trading Corporation

7 Hanover Street **New York, N. Y.**

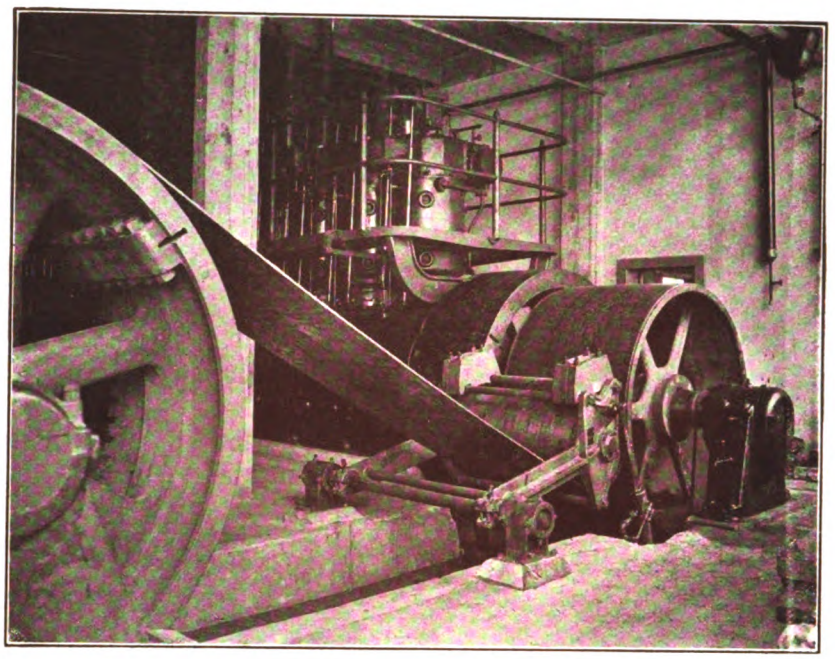
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MAKING ICE WITHOUT SLIP

Driving Pulley

74" Diam x 44" Face
200 RPM

Double Leather Belt
42" Wide
7/16" Thick



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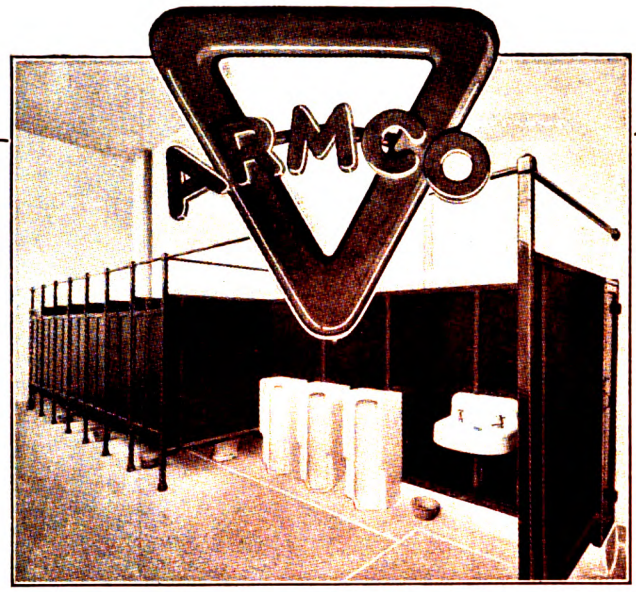
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ENGINEERS

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Sanymetal in the factory of the A.O.Smith Corp., Milwaukee, Wis. Herman J. Esser, Arch.

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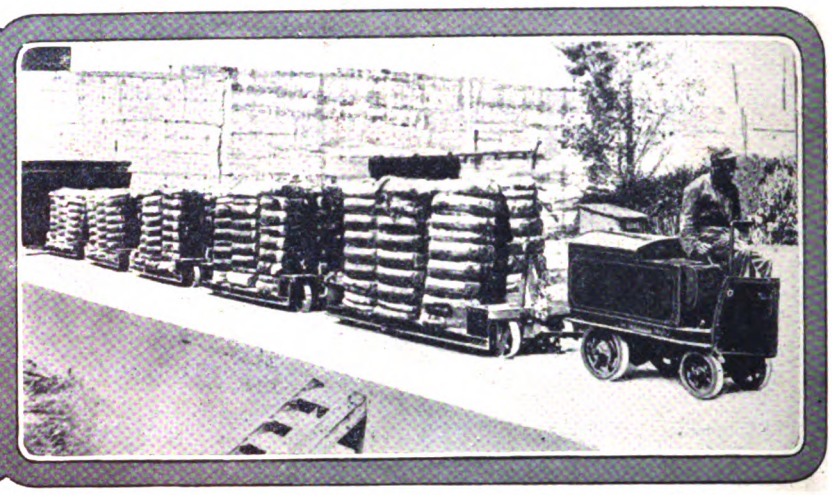
Men, Methods and Machinery of Modern Management

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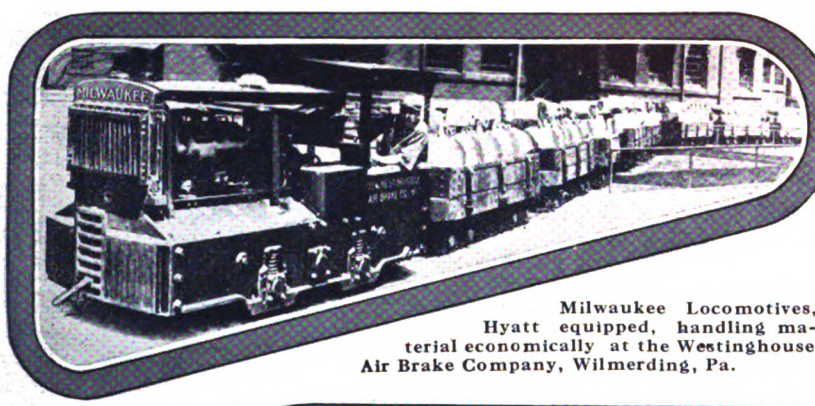
True Economy—Handle any Material, by any Method—on Hyatt Bearings



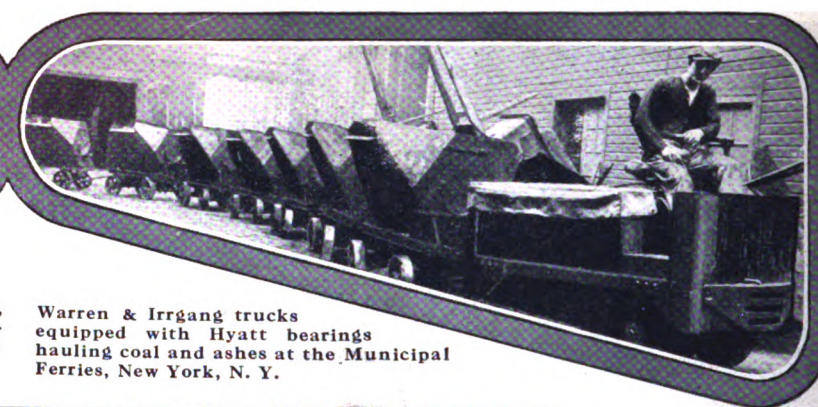
If the two wheel truck method is the best for your product be sure the trucks are equipped with Hyatt bearings—they speed up the work, save lubricant and are durable



These specially designed Hyatt equipped trailers move cotton bales at greater speed with less labor. Trailers and tractor built by the Mercury Manufacturing Company, Chicago, Ill.



Milwaukee Locomotives, Hyatt equipped, handling material economically at the Westinghouse Air Brake Company, Wilmerding, Pa.



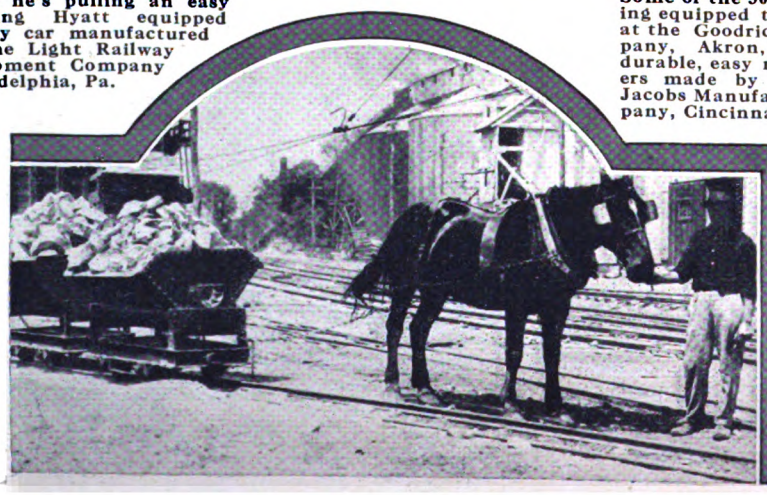
Warren & Irrgang trucks equipped with Hyatt bearings hauling coal and ashes at the Municipal Ferries, New York, N. Y.

Above locomotives manufactured by the Milwaukee Locomotive Manufacturing Company Milwaukee, Wis. Hyatt bearings give satisfactory service throughout the life of locomotives without adjustment or replacement



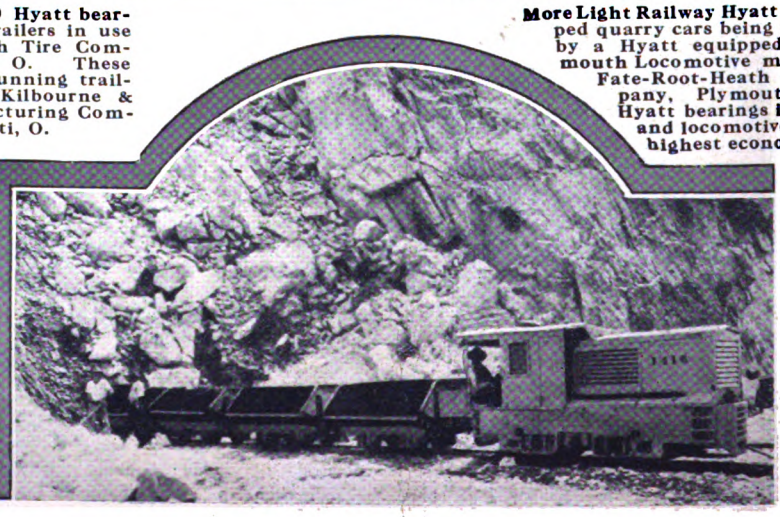
The trucks above made by Warren & Irrgang, Springfield, Mass.—4000 lb. capacity—four wheel steer—Hyatt bearings—replacing horse drawn carts—saving time and labor.

This horse is contented because he's pulling an easy running Hyatt equipped quarry car manufactured by the Light Railway Equipment Company Philadelphia, Pa.



Some of the 500 Hyatt bearing equipped trailers in use at the Goodrich Tire Company, Akron, O. These durable, easy running trailers made by Kilbourne & Jacobs Manufacturing Company, Cincinnati, O.

More Light Railway Hyatt equipped quarry cars being pulled by a Hyatt equipped Plymouth Locomotive made by Fate-Root-Heath Company, Plymouth, O. Hyatt bearings in cars and locomotives give highest economy.



Hyatt Roller Bearing Company, New York, N. Y.

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Industry Illustrated

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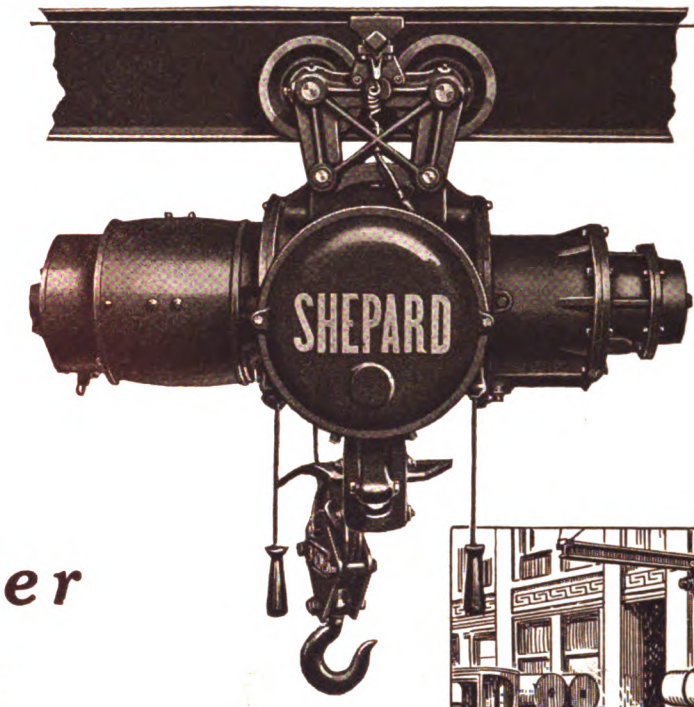
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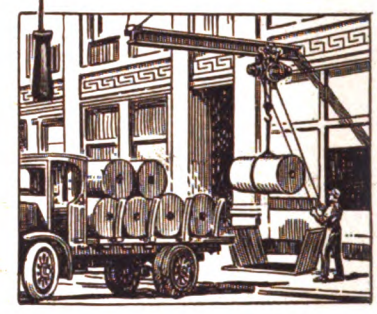
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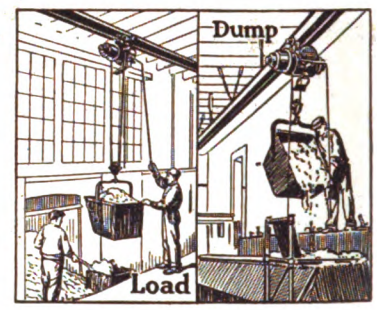
ANNOUNCING the Shepard Electric ***LiftAbout***—a small but powerful Electric Hoist, at surprisingly low cost and negligible upkeep, that brings within the reach of the small as well as the large user, a highly efficient and profitable means for safely lifting, carrying, and putting down loads regardless of what they may be. The same principles of construction are followed that have made "Shepards" the most widely known and used Electric Hoists.

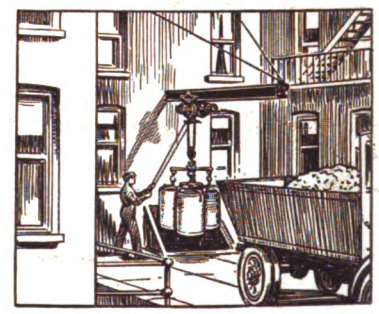
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INDUSTRY ILLUSTRATED

John H. Van Deventer, Editor

W. Thomson Lees, Associate

Reginald Gordon, Associate

Editorial:

Hard Times are Healthy Times

THESE are hard times: hard for the Executive who must reconcile costs with dwindled sales; hard for the Worker who finds a lessened demand for his services; hard for the Salesman who everywhere encounters a "buyer's market."

But hard times are *healthy* times: healthy for the Executive who knows how and who translates this knowledge into sane good management; healthy for the Worker who appreciates the need for intelligent hard work, as contrasted with time-filling slackerism; healthy for the real Salesman, who no longer finds the order-taker cluttering up the landscape.

Most of the great fortunes of today, most of the big organizations, most of the successful men—are the product of hard times of the past. No fortune, no organization, no individual success founded on easy times and false prosperity ever endures.

The big men of tomorrow are not the silk-shirt workers and paper millionaires of yesterday. The big men of tomorrow are you men who today refuse to use "hard times" as a cloak for inefficiency or laziness. You are the men who today are applying every bit of brain-power, making use of every machine and method and device, to the end that your work—and the necessary work of the world in general—shall be better and more quickly accomplished.

For you, the careers of such men as Roy D. Chapin, Godfrey L. Cabot, Wm. Griscom Coxe, E. K. Hubbard, depicted in this issue, are an earnest of what can be accomplished through a sane, practical philosophy of life and work. To you, better methods of producing, of handling, of purchasing and selling, are not matters merely of academic interest; they are a vital and necessary part of the knowledge which lifts the leaders of men above the herd. It is for you—the big men of today and tomorrow—that the pages of Industry Illustrated are edited.

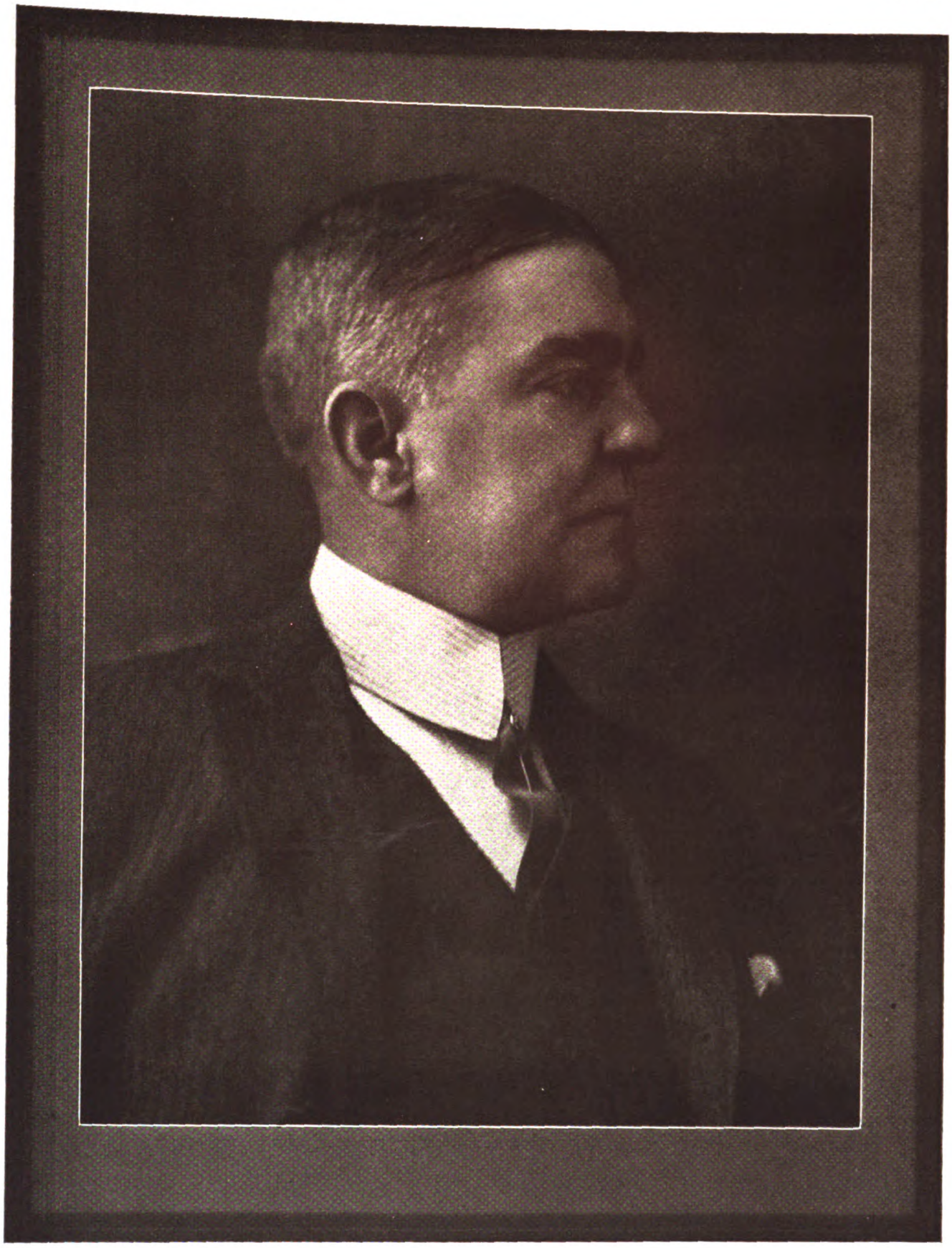
Study the methods and personalities of the successful men portrayed in these pages. Take advantage of the sound, practical helps on selling and purchasing, by men whose experience gives weight to their advice. Study the processes, the machines and methods that have proved of value to other men, and apply them to your own problems. Therein lies the cure for business depression.

Blind optimism won't cure it. Slogans won't cure it. Only common sense and hard work and the intelligence to profit by other men's experience, will drive the poison of "come easy—go easy" out of our systems. Hard times are healthy times. Make the most of them!

Additional copies of this Editorial will be furnished on request

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Men Who



Wm. Griscom Coxe gives us some interesting sidelights on the past, present and future of marine engineering. He speaks with authority, having been at various times foreign representative and assistant general superintendent of Wm. Cramp & Sons Shipbuilding Company; president of Harlan & Hollingsworth Corporation; consulting engineer of the Merchant Shipbuilding Corporation, Chester and Bristol plants; during the war, district manager of the important Delaware River district for the Emergency Fleet Corporation and for three years president of the Atlantic Coast Shipbuilders' Association; vice-president and general manager of the Pusey & Jones Company, Wilmington and Gloucester plants, and a prominent consulting marine engineer.



Has Marine Engineering Kept Pace?

An Interview with William Griscom Coxe

WM. GRISCOM COXE says it has done more than that. And he surely ought to know. For the mechanical mysteries of modern ships are as A B C to this man who graduated from the Royal Technical College, of Charlottenburg, in 1891, and who since then has climbed almost every rung of the naval ladder, commencing operations in the engine room of the Red Star and American lines and continuing through chief executive positions in the plants of our biggest shipbuilders up to the managership of the Delaware River district of the Emergency Fleet Corporation during the World War.

"A ship today," says Mr. Coxe, "is to outward appearance much the same as a ship of ten years ago. Perhaps this is the reason why those who are not familiar with marine engineering wonder whether the progress in our profession has kept pace with the remarkable developments in other lines. But to one who is familiar with the 'insides' of our present-day ships and who also knows the designs which prevailed ten years ago, the answer to your question is so clear as to be overwhelmingly emphatic.

"Just a few months ago, for example, I was invited to attend the trial trip of one of our newest ships. The president of the company and I naturally found our chief center of interest in the engine room. Both of us were old salt-water engineers, and had felt at home amid the multitude of rods, cams, levers, steam cylinders which filled the engine room of ten years ago with a throbbing, thrusting, mechanical giant. But what a contrast now. One could see nothing moving except the slight fluctuations of the indicating hands of various gauges mounted on the wall. Instead of the great triple expansion engines towering

(Continued on Page 65)

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Wh Do Things

A Builder of Industrial Team Work

What E. Kent Hubbard is Doing for Connecticut Industries

A NEW group of men is arising in the industrial world and exercising a powerful influence not only upon industry itself, but on our economic and social development. These men are the leaders in the industrial associations of various types which are rapidly increasing in numbers, strength and activities. The extent to which these organizations are becoming the voice of industry and a medium of contact between industry and the rest of the community makes the character of their leadership a matter of importance.

A vision of what the manufacturers of the highly industrialized state of Connecticut might accomplish by association together brought E. Kent Hubbard of Middletown into the position of President of the Manufacturers' Association of Connecticut, with instructions to reorganize it, make it both worthy and representative of the industries of the State, and put it to work for the good of industry and the community. That was four years ago. Today, Mr. Hubbard and the Connecticut Association are widely known for their participation in constructive and progressive efforts in the industrial organization field.

It has been no rosy path by which the industrial association has arrived at its present powerful influence and broad scope of activities. The field is strewn thick with the wreckage of earlier organizations, victims of the disruptive forces apt to make themselves felt in any group of aggressive and individualistic men such as predominate in the higher ranks of industry. Mr. Hubbard has a definite philosophy which has been his guide in bringing and holding together the manufacturers of his State. It is his belief that a sound and enduring structure of associa-

(Continued on Page 48)



Elijah Kent Hubbard is a notable figure in Connecticut industry. He absorbed a firm belief in team work during his college days when he was a star player on the Trinity Football Team. Through the Connecticut Manufacturers' Association, of which he is the president, he is applying the principles of team work and cooperation in an exceedingly helpful way to the industries of his state. Mr. Hubbard on leaving college entered the mills of the Russell Manufacturing Company, of Middletown, where he began at the looms and rose through the ranks to secretary. Later he organized the Maxim Silencer Company of Hartford, and was its president for two years. He now divides his time between the affairs of the Manufacturers' Association and volunteer service with a number of public and semi-public institutions of his city and state.



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Armament---What

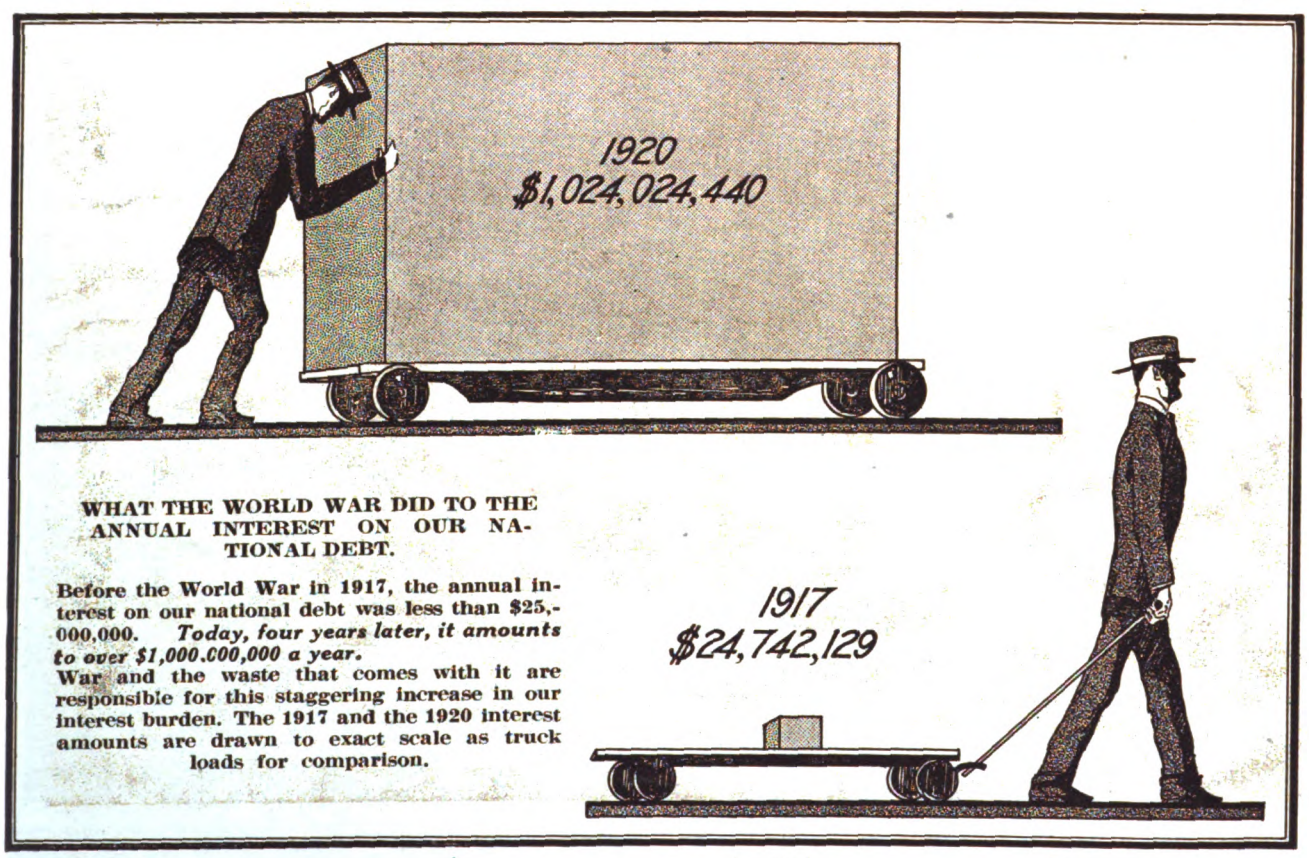
A Visualization of Our

BY JOHN H.



MARS OWNS 40 PER CENT OF YOUR PLANT

Income, war and excess profits taxes collected in 1919 aggregated $3,159,000,000. This was 39 per cent of the total net income of our 317,579 American corporations. While the God of War thus commandeered virtually 40 per cent of the fruits of American industry and commerce, yet the three billions thus levied were scarcely enough to pay our current war, navy and pension appropriations in 1920 and to satisfy the interest of our national debt in the same year of peace.



WHAT THE WORLD WAR DID TO THE ANNUAL INTEREST ON OUR NATIONAL DEBT.

Before the World War in 1917, the annual interest on our national debt was less than $25,000,000. *Today, four years later, it amounts to over $1,000,000,000 a year.* War and the waste that comes with it are responsible for this staggering increase in our interest burden. The 1917 and the 1920 interest amounts are drawn to exact scale as truck loads for comparison.

THE average America has no real conceptio of what it costs him an his hundred million compatr ots to keep our war machine i running order. He may kno that in the year of peac 1920, we appropriated close t two billion dollars just for ou War, Navy and Pension De partments. But he hasn't th faintest idea of what this ap propriation means because h has probably never given thought to the equivalent pur chasing power of two billio dollars.

Most of us average Amer cans are in fact psychologica ly unfitted to visualize the pur chasing power of a million do lars to say nothing of billions We are only familiar with th units of measurement wit which we come in daily con tact. We feel at home whe feet, inches and yards are men tioned, and can visualize th purchasing power of dollars tens and twenties. But th millions and billions that ar glibly used to measure ou armament appropriations con vey almost as little meaning a the "light years" with whic astronomers designate our dis tance from the star Betel geuse.

And so, when it comes t evaluating appropriations o the magnitude called for b our Army and Navy, we ar as much in the dark about val ues as was the little boy who finding a string of pearls an utterly unfamiliar with thei worth, hastened to exchang them for a toy ship, a pop-gu and some tin soldiers.

Aside from this automati



This sky line is but a sma portion of one borough Greater New York. Be tween 1899 and 1920, in twenty-on years, there has been expended in th five boroughs (Manhattan, Bron Brooklyn, Queens and Richmond) fo building construction all kinds, a total of $3,135

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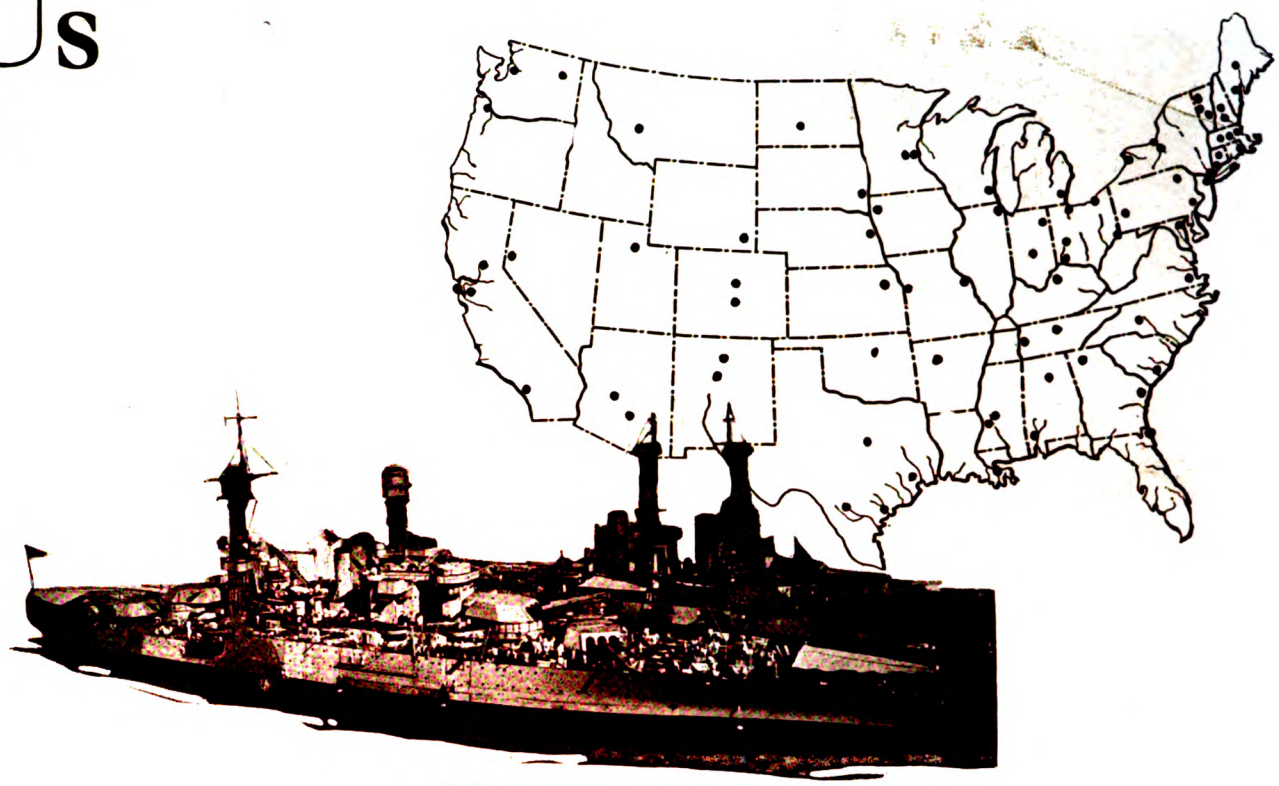
It Costs Us

Armament Burden

VAN DEVENTER

tendency of huge appropriations to camouflage their real economic import, there is a notable but often unnoticed tendency of any national war machine to grow; to require not only the renewing of old parts and their lubrication and maintenance, but also the constant extension of the mechanism. Thus, even omitting our late war from the calculations, we see that the cost of armament has grown steadily and progressively since the Civil War, so much so in fact that the ten-year period from 1900 to 1909, with no war at all, cost us nearly as much in Army, Navy and Pension Appropriations as did the period from 1860 to 1869, which included the entire Civil War. If in 1870, you had told a veteran of the Civil War that a half-century later Uncle Sam would be appropriating for peace-time armament requirements at a rate equivalent to that needed to maintain Grant's and Lee's fighting millions in action, he would have laughed at the idea as an absurdity—yet it has come true, and if war time expenditures of today set the peace-time appropriation rate fifty years hence, what may we expect in 1960?

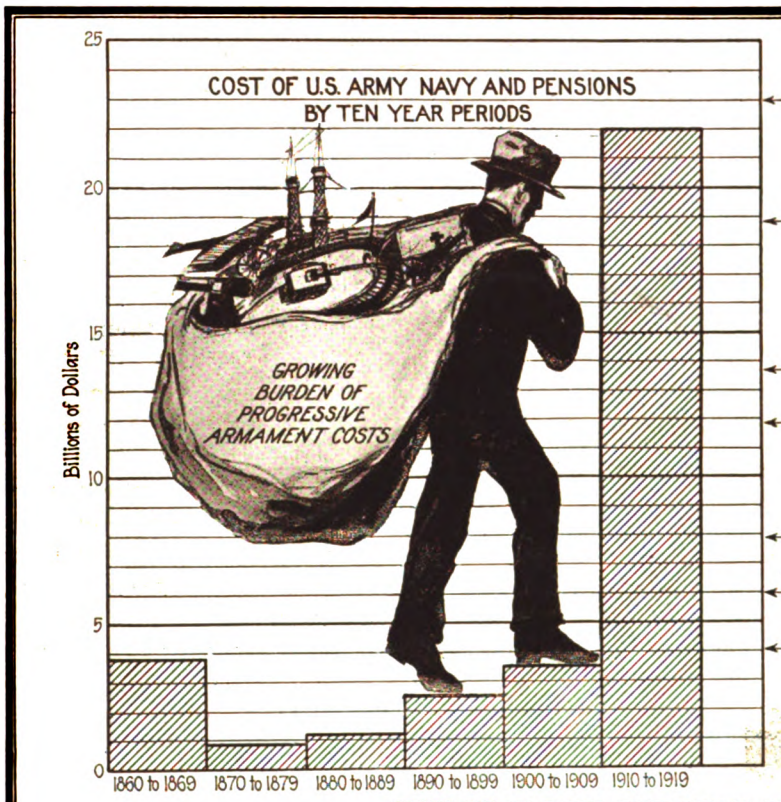
In visualizing the comparisons made on these pages, one additional fact must be kept in mind, namely, the distinction between an investment and an expenditure. When we appropriate money for bridges or public roads or public schools or post offices, that money is not merely an expenditure, it is an investment which returns



OUR HOUSING SHORTAGE—AND OUR NAVY

The black dots on this map represent our forty-eight principal cities. In 1914, which was our last normal building year, the cost of all of the houses, office buildings, factories and other structures erected in these forty-eight cities totalled $673,000,000.

In 1920, we appropriated $629,000,000 for theAmerican Navy.



HOW HIGH WILL THE NEXT STEP BE?

A study of this chart which takes into account only army, navy and pension appropriations, shows that the cost of armament has grown steadily since the Civil War. So much so indeed that the ten-year period from 1900 to 1909, with no war at all, cost us nearly as much for army, navy and pensions as did the period from 1860 to 1869, which included the entire Civil War.



053,000. This sum has built practically every building that you see in this picture and tens of thousands besides that are not included in it.

During the same period the United States has paid out $3,131,147,000 for war pensions alone.

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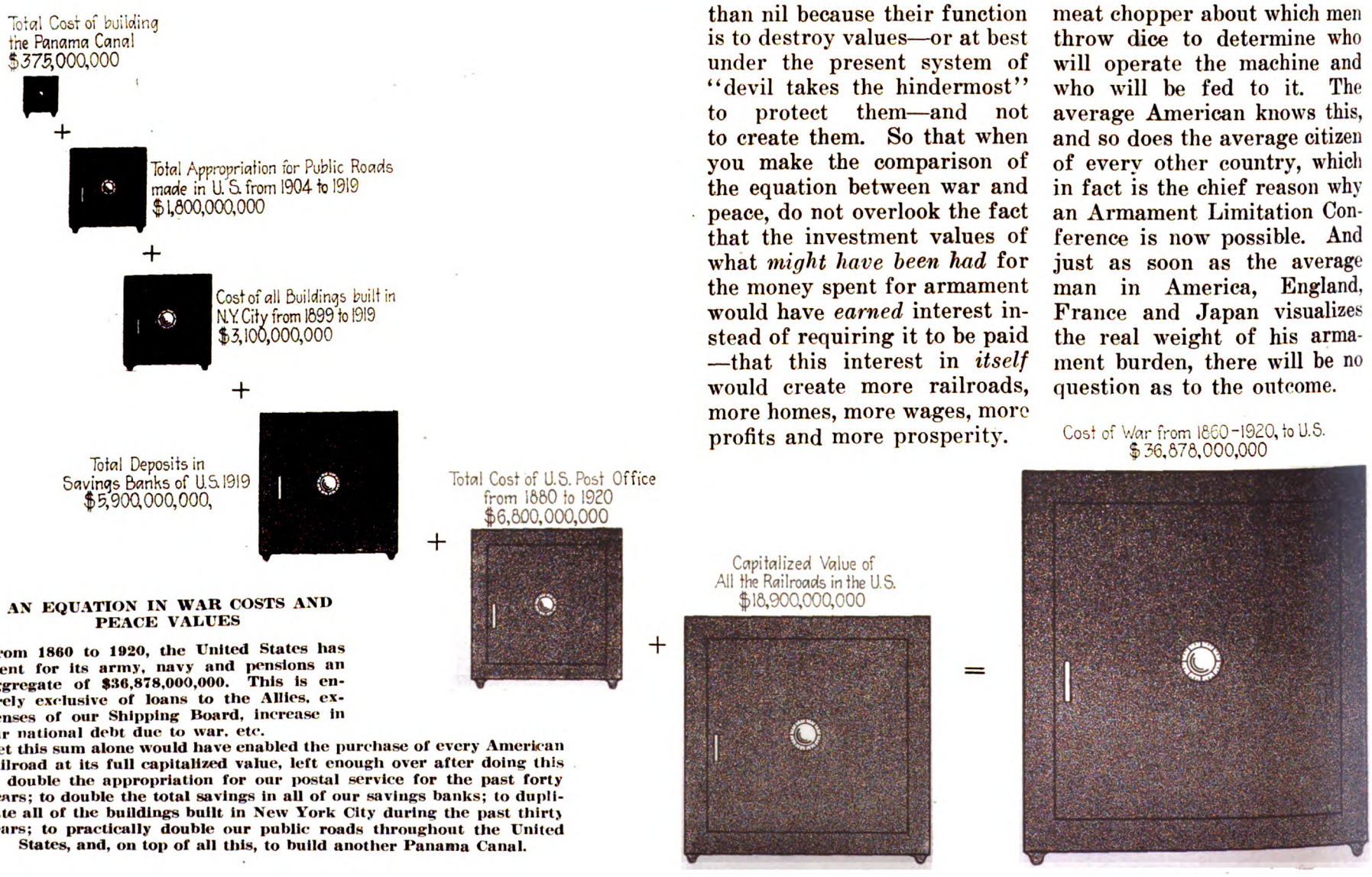


INVESTMENTS VERSUS EXPENDITURES

There is little difference in first cost between a structure such as the Manhattan Bridge shown above and a first-line present-day battleship. From the day that the bridge is opened for traffic it begins to earn public dividends in stimulating business by facilitating transportation. Twenty years later it is still giving 100 per cent service. The battleship is obsolete almost before it is completed. And it costs us over a million dollars a year to keep such a battleship in commission, to buy coal for it and to pay the officers and enlisted men, to say nothing of the expenditures for ordinary repairs.

dividends. When we build a railroad we extend the development of natural resources, open up new territory, provide for new farms and homes, stimulate industry and prosperity, and give useful work to many people. When we build a battleship or a field gun we not only must pay its first cost but we must educate, train and support men to take care of it —men whose productive value is, economically speaking, less than nil because their function is to destroy values—or at best under the present system of "devil takes the hindermost" to protect them—and not to create them. So that when you make the comparison of the equation between war and peace, do not overlook the fact that the investment values of what *might have been had* for the money spent for armament would have *earned* interest instead of requiring it to be paid —that this interest in *itself* would create more railroads, more homes, more wages, more profits and more prosperity.

Whether or not we have a continuation of progressive armament and war or progressive disarmament and peace, depends not so much on our statesmen and diplomats as upon the average American. There is little left of romance in modern war for the average American who has had a share in the last one. It has merged into a vast business undertaking in which romance is replaced by science and finance. It has become a huge human meat chopper about which men throw dice to determine who will operate the machine and who will be fed to it. The average American knows this, and so does the average citizen of every other country, which in fact is the chief reason why an Armament Limitation Conference is now possible. And just as soon as the average man in America, England, France and Japan visualizes the real weight of his armament burden, there will be no question as to the outcome.



AN EQUATION IN WAR COSTS AND PEACE VALUES

From 1860 to 1920, the United States has spent for its army, navy and pensions an aggregate of $36,878,000,000. This is entirely exclusive of loans to the Allies, expenses of our Shipping Board, increase in our national debt due to war, etc.
Yet this sum alone would have enabled the purchase of every American railroad at its full capitalized value, left enough over after doing this to double the appropriation for our postal service for the past forty years; to double the total savings in all of our savings banks; to duplicate all of the buildings built in New York City during the past thirty years; to practically double our public roads throughout the United States, and, on top of all this, to build another Panama Canal.

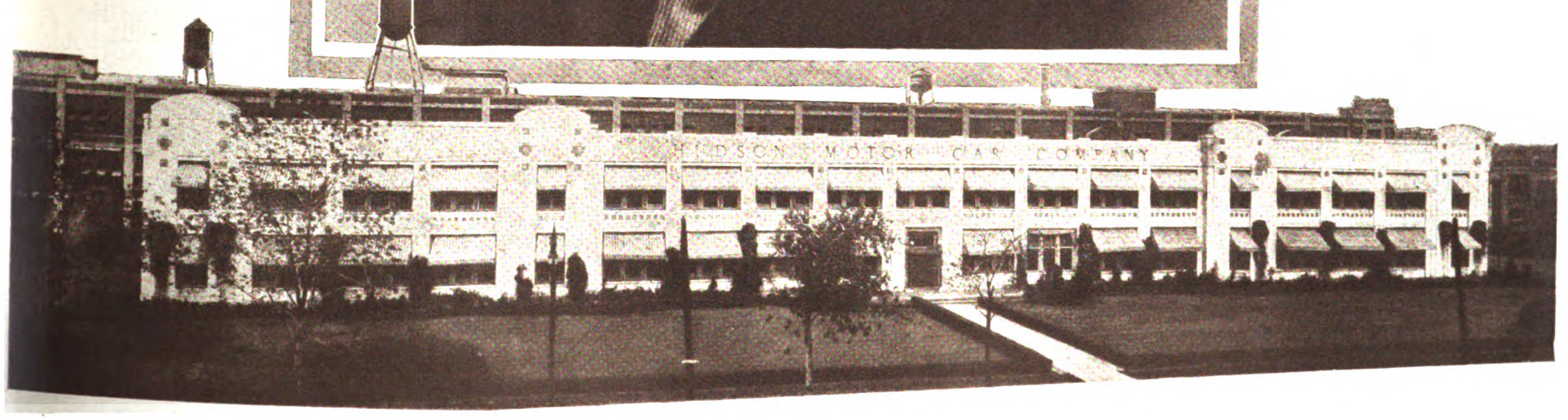
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Developing Executive Ability from Within the Ranks



For the past eleven years Roy Dikeman Chapin has been chief executive of the Hudson Motor Car Company—yet he is today but forty-one years old. Twenty of his years have been intimately identified with the progress of the automobile. At the age of twenty-four he was general sales manager of the Olds Company. Two years later he helped to organize the E. R. Thomas-Detroit Company. In 1908, he with Howard E. Coffin and Hugh Chalmers brought the Chalmers-Detroit Company into being. Mr. Chapin was its general manager and treasurer for two years. In 1909, he with others, including Howard E. Coffin, F. O. Bezner and R. B. Jackson, organized the Hudson Motor Car Company.

Mr. Chapin is identified with many prominent Detroit enterprises and maintains an active interest in public affairs. He is an enthusiastic supporter of aviation and treasurer of the Aero Club of Michigan. During the war he was head of the Highways Transport Committee of the Council of National Defense.



An Interview With Roy D. Chapin

A MAN must be unusual in some respect to have been for ten years the president of one of the world's largest and most modern manufacturing concerns and yet be able to write his age down as forty-one; and it is more than of passing interest to know that this same man is one of the two pioneers in the automobile industry in Detroit who continue to head their own organizations.

The man is Roy D. Chapin, President of The Hudson Motor Car Co., Detroit, Mich., who has been active in the building of high grade automobiles for the past twenty years. Mr. Chapin shares honors for an unbroken service record with Henry Ford, who has seen more than twenty years of activity in this fascinating business.

When I talked recently with Mr. Chapin, who is one of the youngest presidents in the Detroit automobile industry, despite the fact that he is probably the oldest from the standpoint of service, he was reminiscent of the early days when Detroit was first gaining rec-

(*Continued on Page 62*)

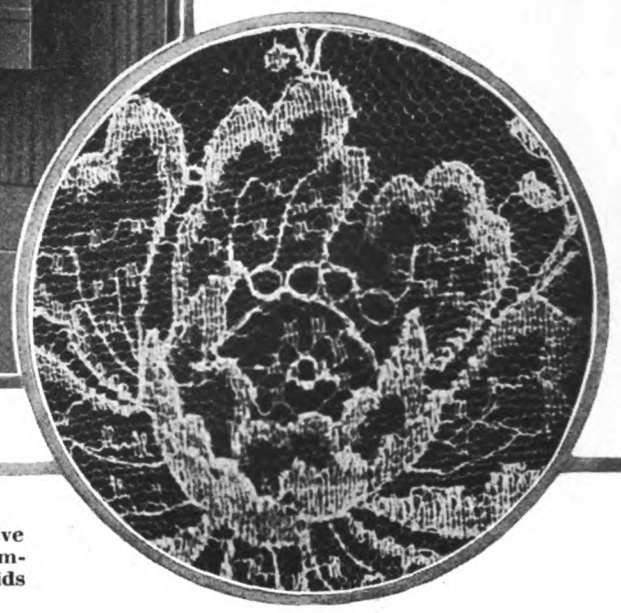
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The Camera as a

Some Practical Applications



Public service companies of several cities have adopted this special meter-reading camera. It eliminates possible human errors in reading, and avoids disputes.



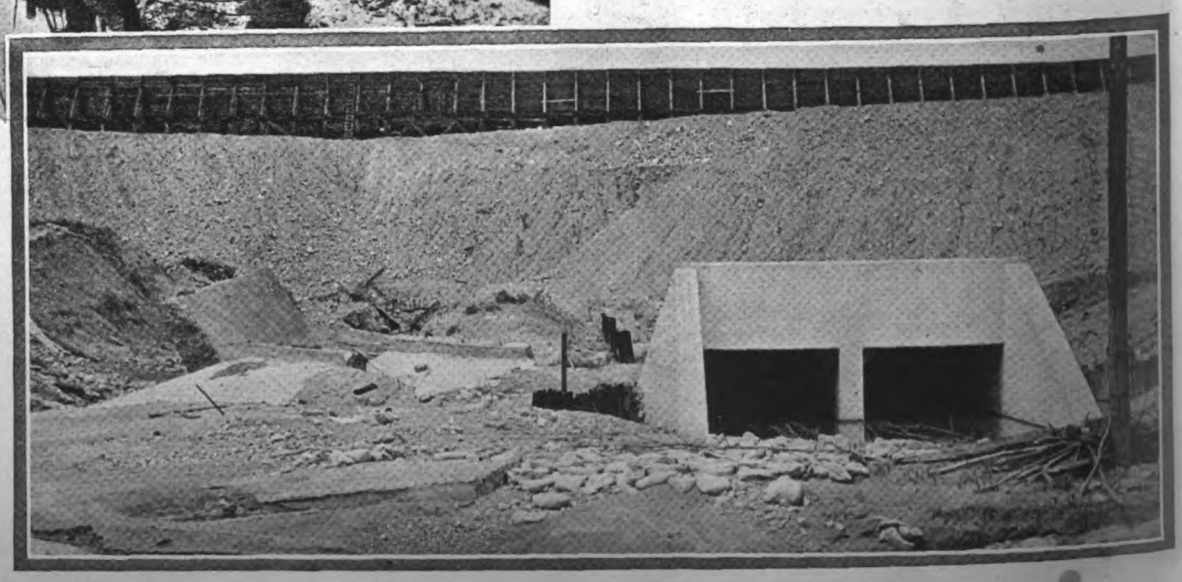
Below—Photographic reproductions of lace patterns are more convenient to show, and can be more widely distributed, than samples.

THE time of exposure required to procure a photographic copy of a landscape is from seven to eight hours; but single monuments, when strongly lighted by the sun or which are themselves very bright, can be taken in about three hours." This statement was made less than one hundred years ago by Daguerre, one of the pioneers in the development of photography. Is it any wonder, then, that in its early days photography had scant recognition from the hard-headed business man?

The same "monument strongly lighted by the sun" that then required an exposure of three hours, today can be photographed with an exposure of but *one one-thousandth of a second.* This development in practicable speed of exposure results from a combination of factors; betterment of sensitive emulsions, discovery of developing and intensifying agents, better lenses, and so on; the list of men whose work contributed to the progress being a long one. In this country, probably the contributions of George Eastman did more than any other one thing to further the simplification and consequent commercial development of photography. Through this simplification, we find the camera invading every field of activity, providing new and better ways of accomplishing things wherever it goes.



Engineering firms and contractors find photographic records of working conditions and progress of work an invaluable aid, both as a means of showing work accomplished, and for purposes of comparison with jobs under contemplation.



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Business Speeder

of Commercial Photography

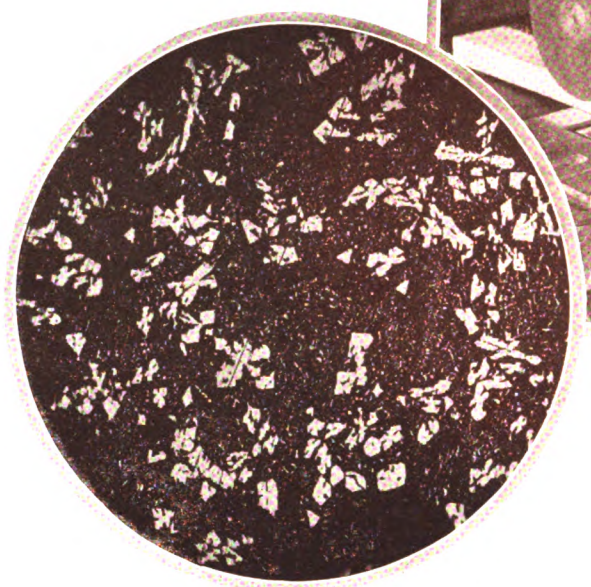
Publishing, from the daily newspaper to the magazine, has been revolutionized by photography. The events which the reporter or correspondent labored through columns of type to visualize, are now pictured— as in this magazine—to the last detail with the click of a shutter.

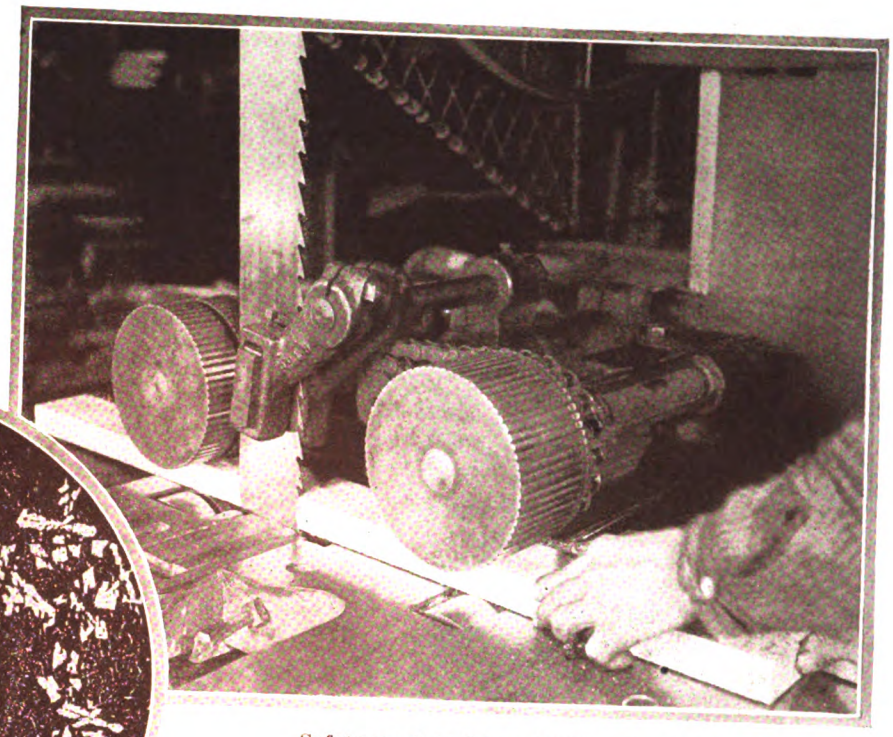
The advertiser uses photography for purposes of illustration because it has distinct advantages in realism and reality over any drawing. Photographs also introduce a personal factor which no advertising psychology can ignore.

But commercial uses are not limited to advertising and publishing. The salesman who could not move at one time with less than half a dozen trunks, now carries an album of photographic samples in his

(*Continued on Page 46*)

Below—Photo-micrographs are more and more coming into use in connection with the inspection of metals, textiles, and so on.





Safety work is driven home more effectively by appealing to the eye than by merely telling what should be done.

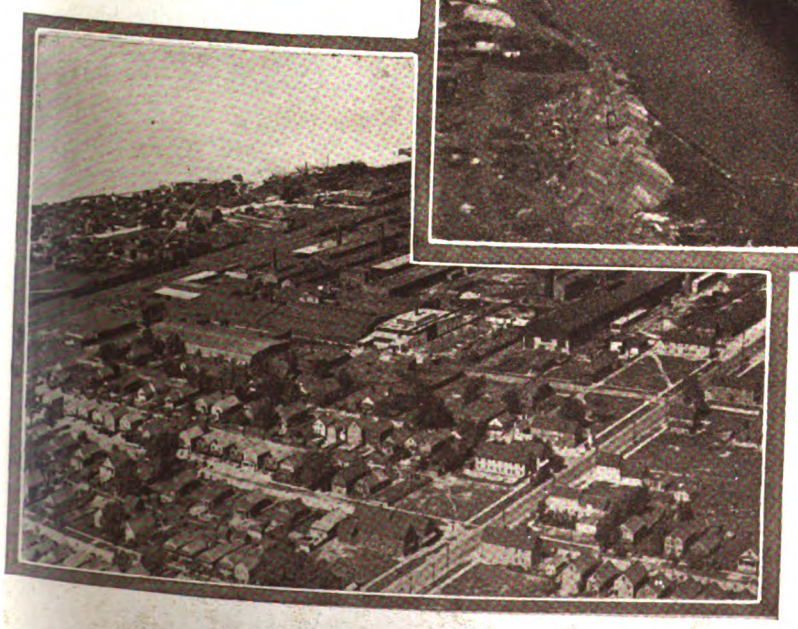


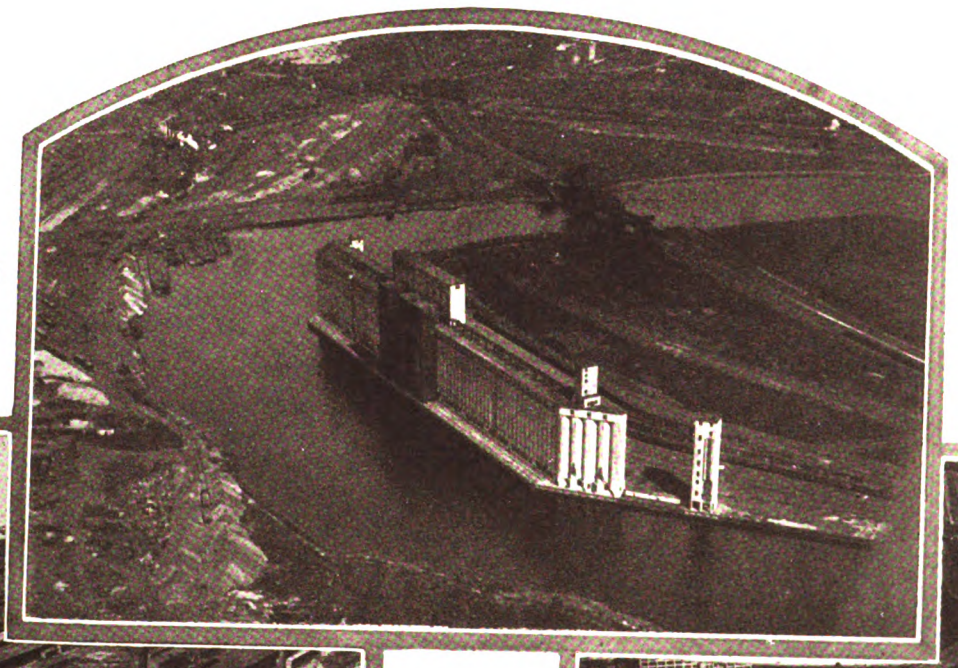
Hard to describe, it is easy to show the right way to lift heavy things.

Airplane views, which owe their rapid development to the war, are proving of immense importance in commerce. Not only the "view of our factory," but plant layout, terminal facilities, housing developments, and so on, can be shown and studied as was never possible before.



By showing both right and wrong ways, the difference is apparent.







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More Ton-Miles per Dollar of Up-Keep

Maintenance and Repairs in the Modern Truck Garage

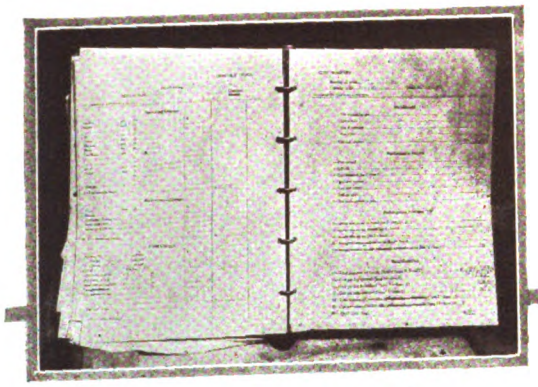
WITH the exception of the illustration at the right and the one of a loose-leaf book below, all the views on these two pages were taken in the garage of Adolph Gobel, Inc., Brooklyn, N. Y. This concern manufactures sausages and other delicatessen products, and maintains a fleet of seventy-five motor trucks to haul in the raw material and deliver the finished product.

The entire fleet is under the direction of Mr. Adam Horr, who in his five years as transportation superintendent has developed a system which is conceded to be one of the most efficient in the country. To sum up in a few words the basic idea underlying the equipment and methods employed by Mr. Horr, it amounts simply to this: That his job consists in getting the most ton-miles of haulage with the absolute minimum of delay or avoidable expense. Every detail of operation is planned for that purpose, every bit of equipment was installed solely with that end in view.

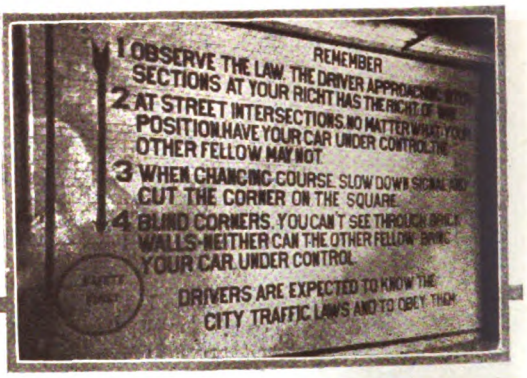
For example, it happens occasionally that a motor breakdown incapacitates a truck, not for an hour or two but for days. The answer to that is, to carry on hand a complete



The time clock, in this case, is not so much interested in the driver's time as in the time-per-trip of the truck. This, in connection with speedometer readings, furnishes a means of checking up costs per mile.



The Standard form of cost and performance sheet developed by The Commercial Vehicle furnishes an excellent means of recording truck performance.

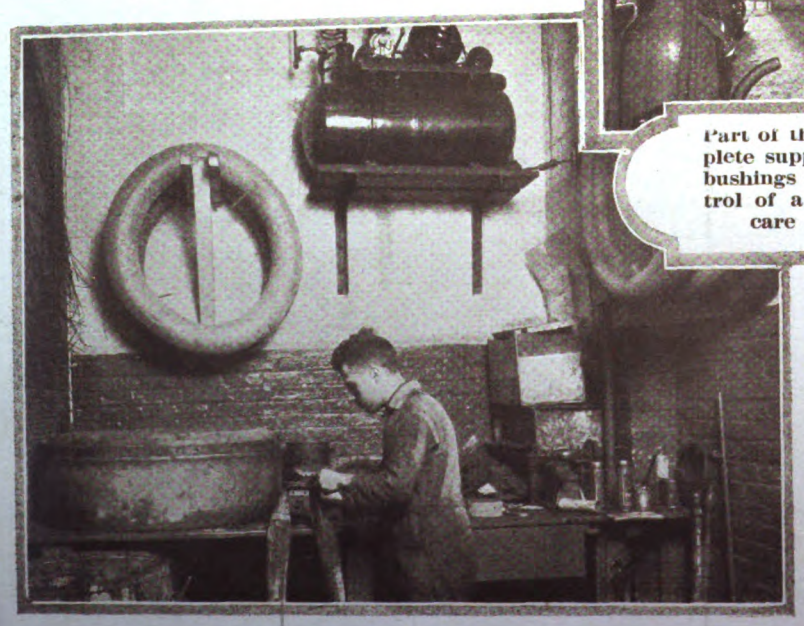


Every time a truck enters or leaves this garage, the driver encounters this reminder, painted on the wall in six-inch letters.



Part of the stock-room, where a complete supply of tires, lamps, bearings, bushings and so on is kept under control of a stock-clerk who also takes care of inner-tube repairs.

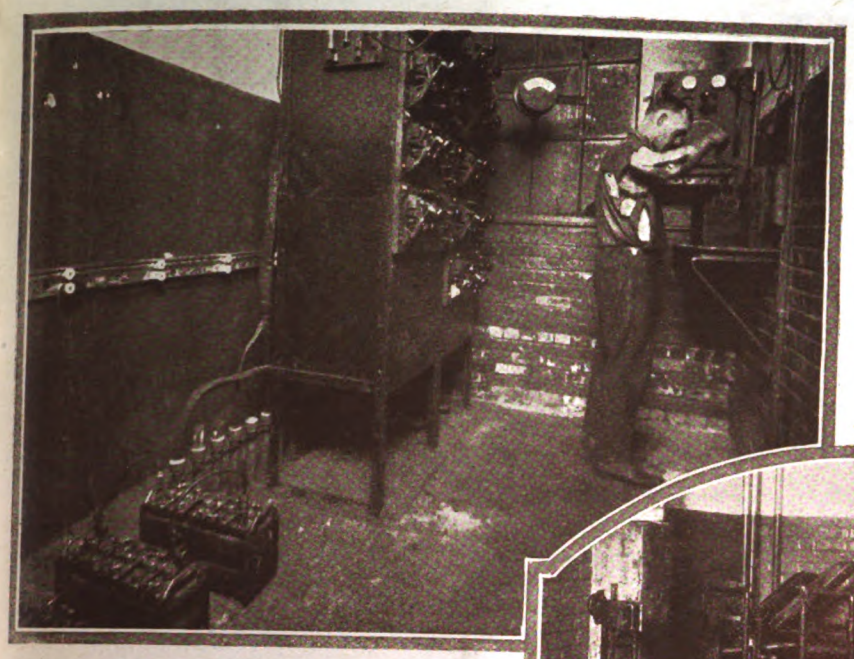
A vulcanizing outfit is part of the equipment in the stock department, enabling the stock clerk to occupy his time on inner-tube repairs.



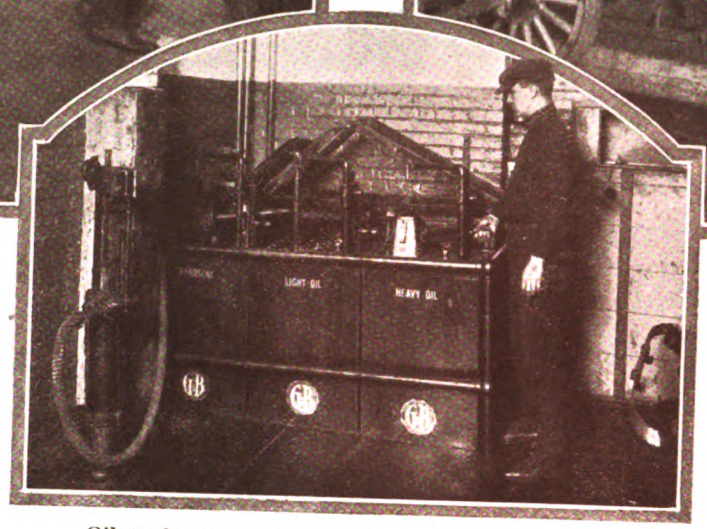
No time is lost in getting the necessary parts or supplies to effect quick repairs. This alone is an important item in truck operation.



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Storage batteries give longer life if kept in repair and fully charged; hence this battery-room and charging outfit.



Oil tanks on the ground floor, from which oil is piped to the floor above as well. The night men take care of all oiling when they wash the cars.



Three spare motors—one for each type of truck in service—are kept on stands, ready to replace a crippled motor on any of the trucks.

spare motor. Then, when a truck is towed in with its motor requiring major repairs, the spare motor is put in and the truck is back in service while its former engine is being repaired in the shop. As there are three different types of truck in service, they keep three extra motors on hand. The same is true of transmissions and rear-axle assemblies, while of course a complete stock of minor parts is maintained.

The keeping of a complete parts stock room entails the services of a stock clerk. Since his time is only partly occupied on this work, he also attends to vulcanizing and repair of inner tubes. Oiling, greasing, filling the radiator and so on, are attended to every night—not by the chauffeurs, but by the night men as a part of their work in washing and cleaning the trucks. Even the often-overlooked detail of keeping the floors clean, is attended to here—with full recognition of the bad effect of greasy floors on tires.

The completeness of the equipment at the Gobel garage and its record of efficiency in keeping the seventy-five trucks everlastingly on the job are not due to a policy of "Spend what you wish, no matter how much, so long as the trucks run." On the contrary, every bit of equipment and every expenditure must justify itself. The watchword is not "How much will it cost?"—but "How much will it *save*."



An electric scrubbing machine keeps the concrete floors from getting greasy and thus prevents the rapid deterioration of tires from this all too common cause.

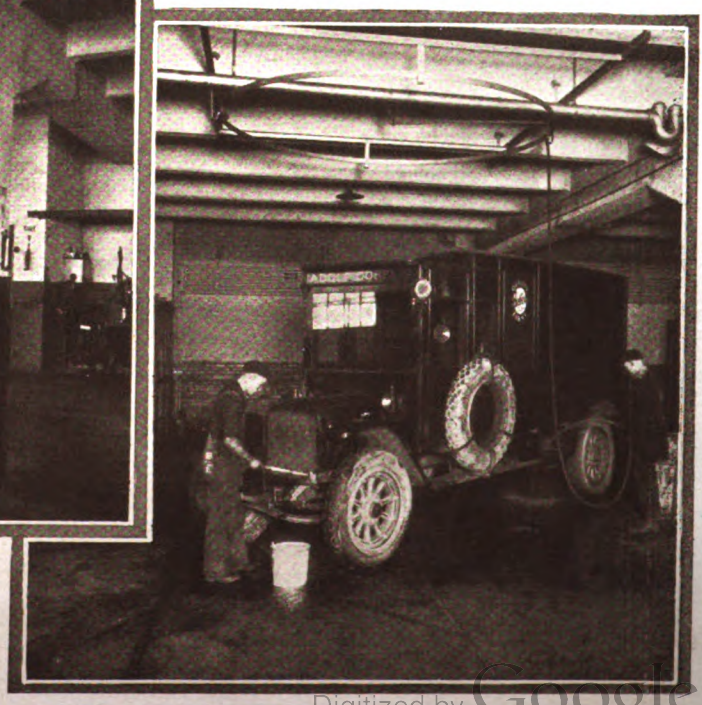
Live steam is used, with lye, to dissolve the grease from parts under repair. Gasolene costs too much for this work.





From any part of the garage, one can instantly locate fire-extinguishers in case of emergency.

Proper washing plays no small part in keeping a truck out of the repair shop. Equipment like this saves time on the job.



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How We Are Using

Four Executives Tell

Making Costs Prophesy

BY S. B. SCOTT

THE purpose of a good cost system is to show not only costs as such, but to present the figures in such a way that deductions can be drawn as to the reasons for these figures and the possibilities of cutting them down.

The executive should, therefore, when considering his Cost System, see to it that the figures presented are in such form that they give him the information desired in the simplest manner possible. Don't have essential facts wrapped up in a conglomeration of unessential information, make the costs as simple, direct and to the point, as possible. Having obtained these results, the executive should know how to use them. Costs serve far more than the obvious purpose of showing the margin between Cost and Selling Price, if used properly. They should tell the executive what lines pay and what do not. They should show where the "weak spots" are in the process of manu-

(*Continued on Page 59*)



S. B. Scott, who tells us how to make costs prophesy, is associated with the Imperial Oil, Limited, of Canada. He is a chartered accountant and was in charge of cost accounting and financing for the nine British Government plants erected in Canada during the war. He was also auditor for the Royal Flying Corps and for the Canadian Shipbuilding programs.

Signalling the Cost Range

BY E. A. BECKER

ONE does not have to go back many years to the time when cost systems were used solely to obtain statistics of cost history, and more or less ancient history at that. With labor and material costs at an approximately fixed rate and with business on a healthy basis, such records were of value for price fixing and as indices of spots where possible economies could be effected. However, in the confusion of business conditions which exists today such histories, no matter how modern, are of little use.

Today, the executive who is in possession of a cost department which is alive to its opportunities is in a strategic position which is difficult to overestimate. His cost reports can be likened to the signals given a marksman in rifle practice so that site, distance, and windage can immediately be adjusted.

Let me define what in my opinion constitutes the groundwork of an adequate series of cost reports.

Statements should be laid upon the executive's desk each morning, as well as recapitulations at the close of each week, month, and fiscal period, which will be as nearly uniform in

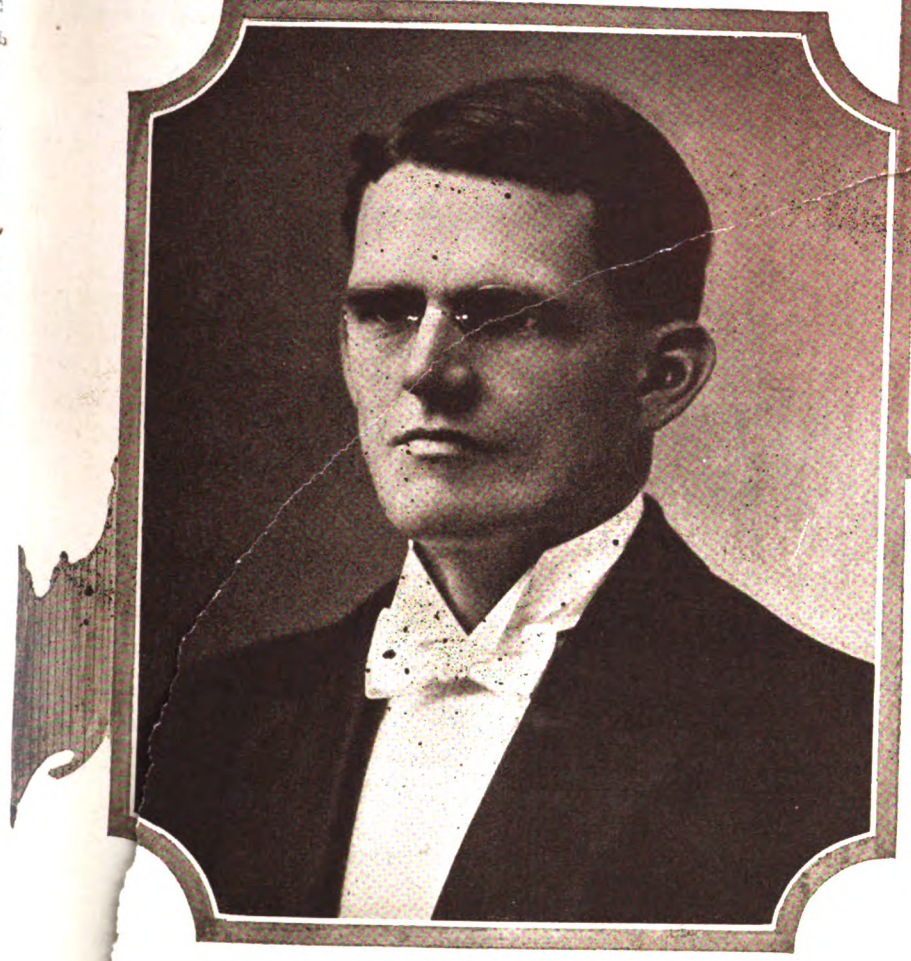
(*Continued on Page 52*)

E. A. Becker, who is the comptroller of the Larkin Company, of Buffalo, attended Cornell University from 1895 to 1897. A year after this was spent in getting the rudiments of business, but in 1898, Mr. Becker laid down the pen for the sword, volunteering for service in our war with Spain. After his sojourn in Cuba, he became bookkeeper for the New York Car Wheel Company, later cashier and assistant auditor of the H-O Company and the Force Company, becoming auditor for Larkin Company's branches in 1906, and rising since then to the position he now occupies. Mr. Becker is President of the Buffalo Chapter, National Association of Cost Accountants,

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Costs to Cut Costs

Us How to Go About It



Noyes D. Farmer is a graduate of Boston University College of Business Administration. His experience of nearly twenty years has included cost accounting and production control in widely diversified industries. Mr. Farmer is Comptroller of The Carborundum Company, Niagara Falls, N. Y. He is an Associate of The American Society of Mechanical Engineers, and a Member of The Society of Industrial Engineers and National Association of Cost Accountants.



George Mahon began business life as an office boy and got his education in accounting at night school, finally securing a position as junior with a firm of certified public accountants in Philadelphia. In addition to many years of public practice, Mr. Mahon was for seven years auditor and director of the Craddock-Terry Company. During the war he was comptroller and later treasurer of E. F. Houghton & Company, of Philadelphia. He returned to public practice in 1920, and is now Managing Partner at Chicago for Hilton, Mahon and Knowles.

Control Through the Cost System

BY NOYES D. FARMER

THE most important function of a cost system is to control all the costs of business operations. The correct cost practice should enable your organization to know, currently, what is obtained for the money spent on labor, material and overhead. Having this adequate control, correct costs will follow as a natural sequence.

Let the executives become acquainted with the methods employed in collecting and summarizing the cost figures. The lack of this knowledge often results in the management refusing to believe actual costs that are not in accord with their preconceived ideas. "Costs and Confidence" go together.

Sell your cost system to your operating heads. Lay stress on the fact that it will disclose the man who is rendering genuine service, the management measuring in terms of dollars and cents the results he is obtaining.

Keep close to your shop superintendents and foremen. You depend directly on them to better the conditions brought

(*Continued on Page 45*)

How Stands the Score?

BY GEORGE MAHON, C. P. A.

WHEN the average American citizen reaches the base-ball park about the middle of the third inning, does he sit down to study a detailed report of yesterday's game, showing each player's number of times at bat, runs scored, base hits, bases on balls, sacrifice hits, stolen bases, put-outs, assists and errors? He does NOT. One glance at the big score-board shows him how today's contest stands NOW; and, with an expectant smile, he settles down to enjoy the game as it progresses.

Why, then, do so many apparently intelligent industrial executives content themselves with delayed reports, showing in infinite detail the items of cost, production, sales and profits or losses of the PAST, instead of insisting upon promptly getting condensed reports and vivid graphs of current operation, which would enable them to actively participate in the events of TODAY?

This is one of the most momentous questions now confronting our industrial lead-

(*Continued on Page 60*)

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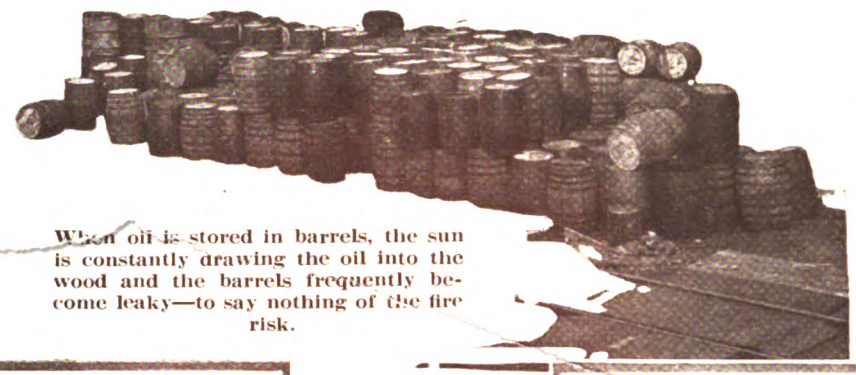
Oil Problems of Modern Plants

Equipment that Eliminates Waste and Fire Hazard

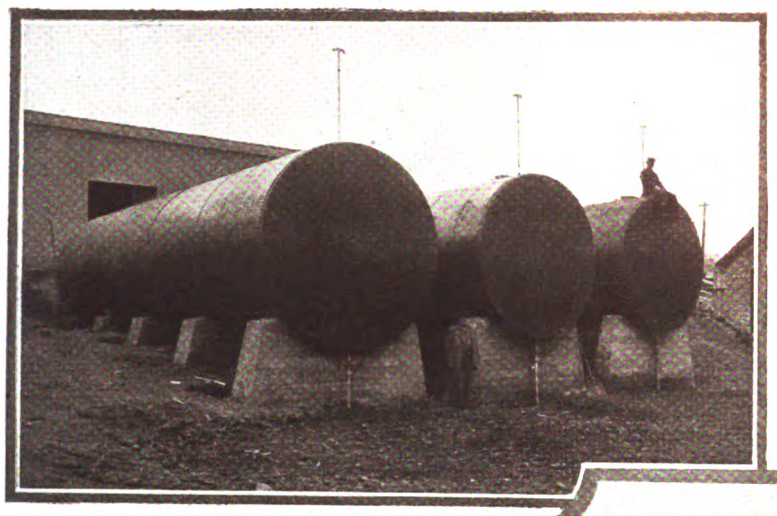
DO you remember away back when, as a kid, you were sent to Hopkins' general store with the old spout-can to get a gallon of kerosene? And Old Man Hopkins took the can to his smelly old store-room and filled it from a more or less leaky wooden barrel equipped with a spigot. And then, one night, the whole town turned out for the most gorgeous fire in all your boyhood recollection—the night the Old Man dropped some pipe ashes on the store-room floor.

Old Hopkins didn't know any better way of keeping oil; there wasn't any, then. As far as the leaks and waste were concerned, they were included in the price you paid. As to the fire risk; that was a chance, ever-present, but never fully appreciated until the thing really happened.

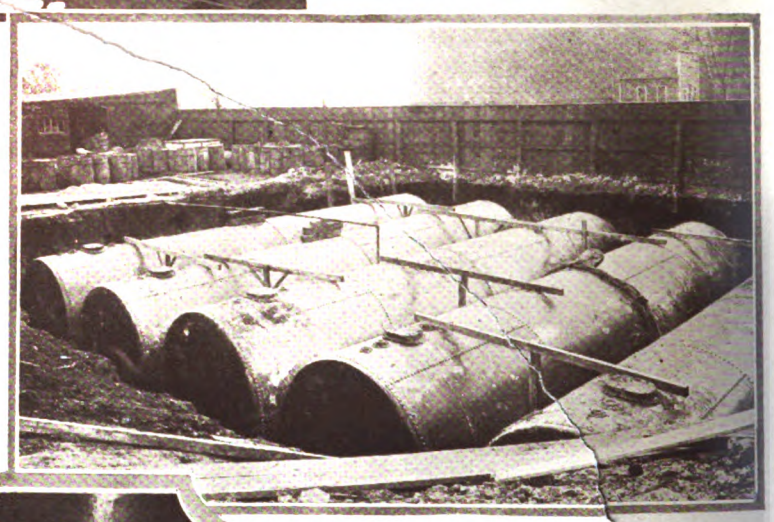
But nowadays, you say, that sort of thing "isn't done any more." It certainly *shouldn't* be—with so many better, safer, more economical methods available. Yet there still are a good many counterparts of



When oil is stored in barrels, the sun is constantly drawing the oil into the wood and the barrels frequently become leaky—to say nothing of the fire risk.



Instead of a yard full of barrels, three scientifically built containers which will last a life-time.

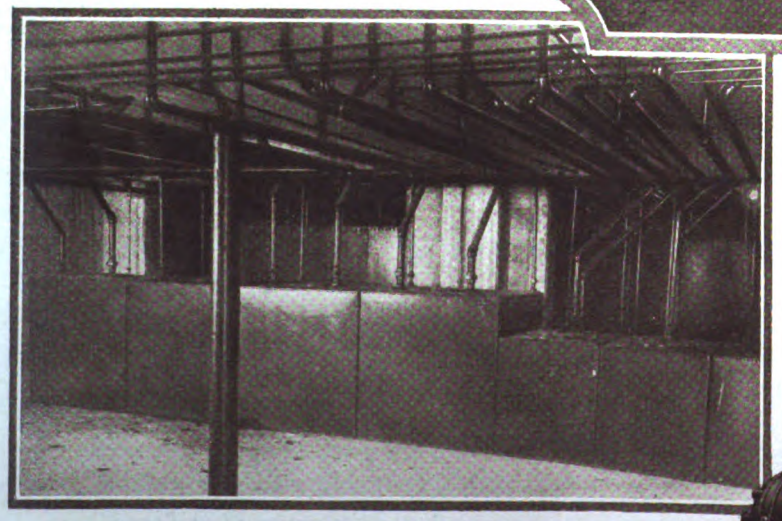


Underground storage conserves valuable space, at the same time providing safety from fire exposure.

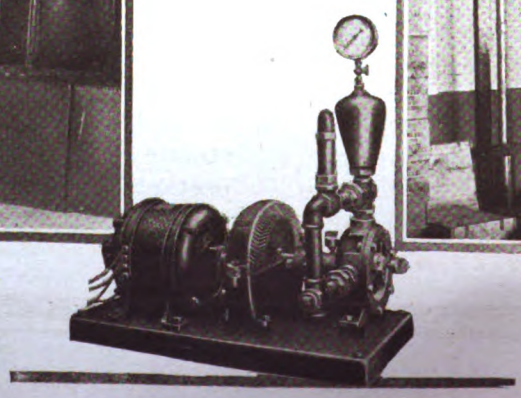


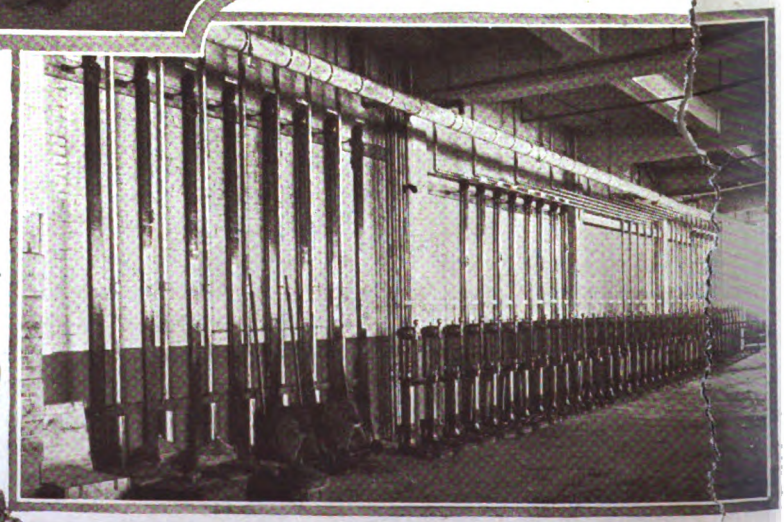
The illustration in the center has an atmosphere of peace and socialbility that reminds one of the old-time country store—

—but the waste of oil, waste of time, and the fire hazard make this a mighty expensive method of storing oil.



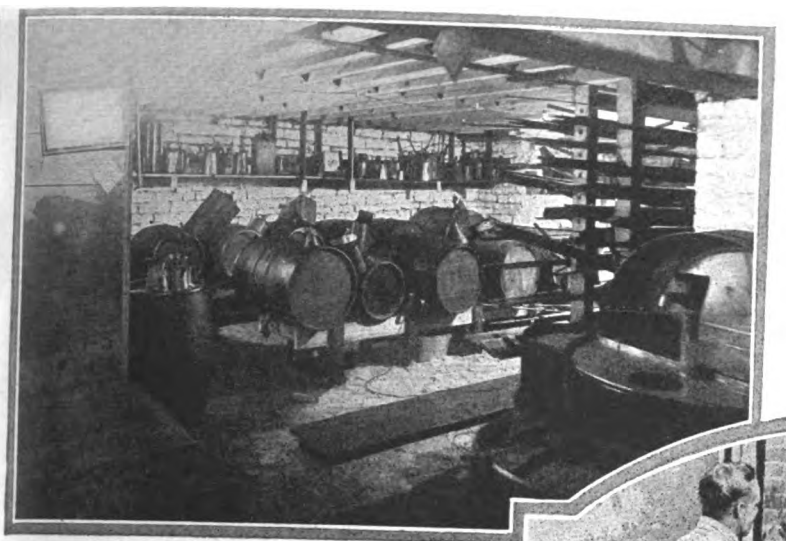
A typical modern oil storage system in use by the Michigan Central R.R. at Niles, Mich. A large amount of oil, neatly and compactly stored.



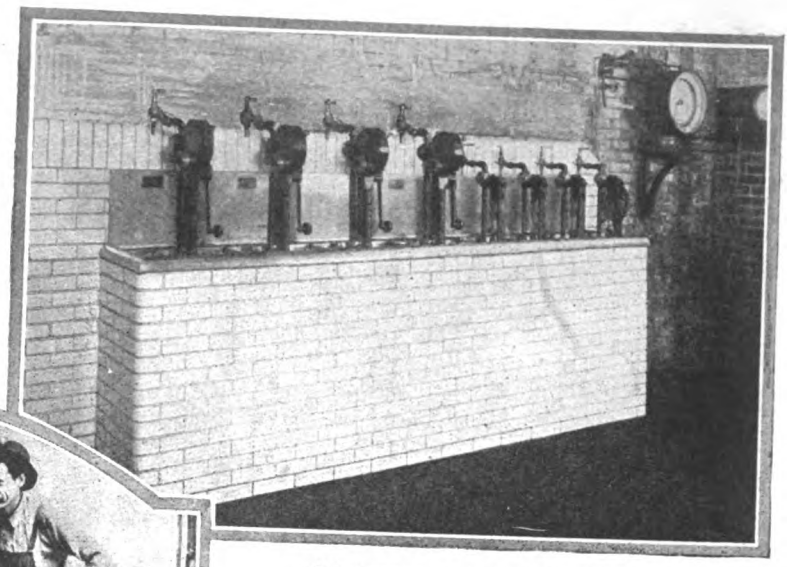


Installation at the Westinghouse Electric Co., where a variety of oils are used in large quantities. Pumps connect to large tanks in the basement.

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A typical oil room of a large hardware company—inexcusable from both fire-hazard and economy standpoints. Contrast this with the method shown at the right.

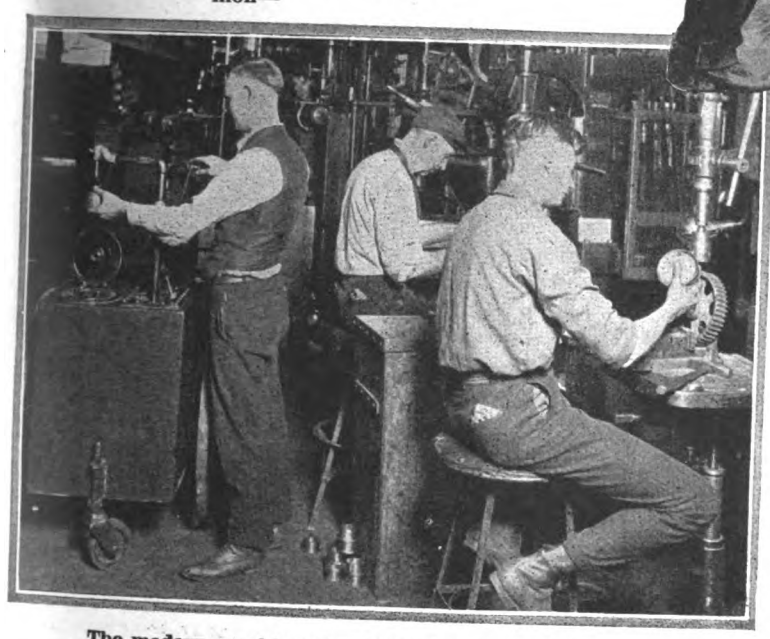


Oil storage system of the St. Joe Light and Power Company, St. Joe, Mo. Not alone safety from fire and economy of oil, but economy of space is an argument for the new way.

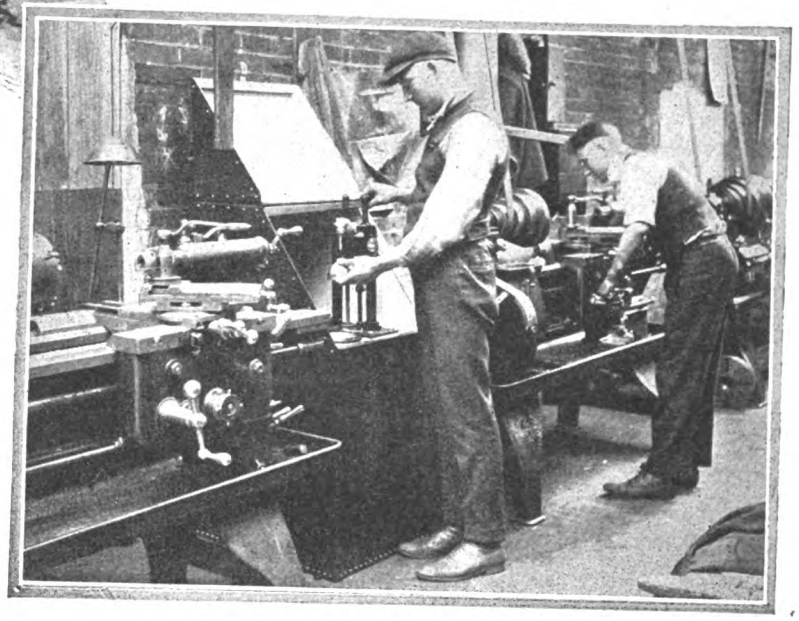


The insert shows another one of those sociable scenes that are all too common—

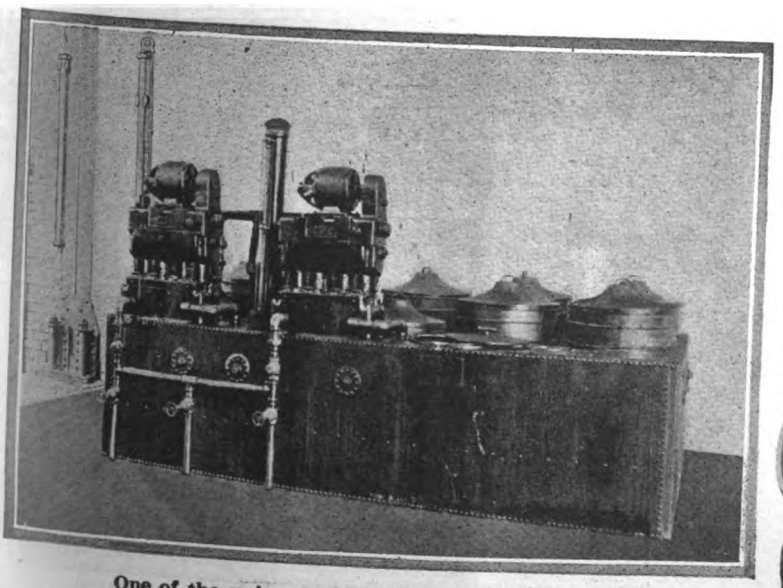
—Here, the story was so interesting that the oil flowed on and over, unnoticed.



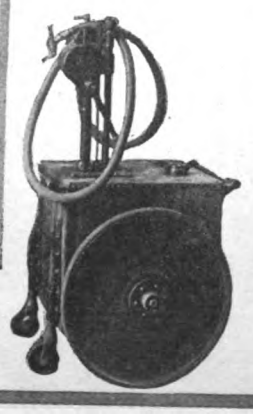
The modern machine shop finds it worth while to take the oil to the machines, rather than have the small oil-cans brought in for refilling.

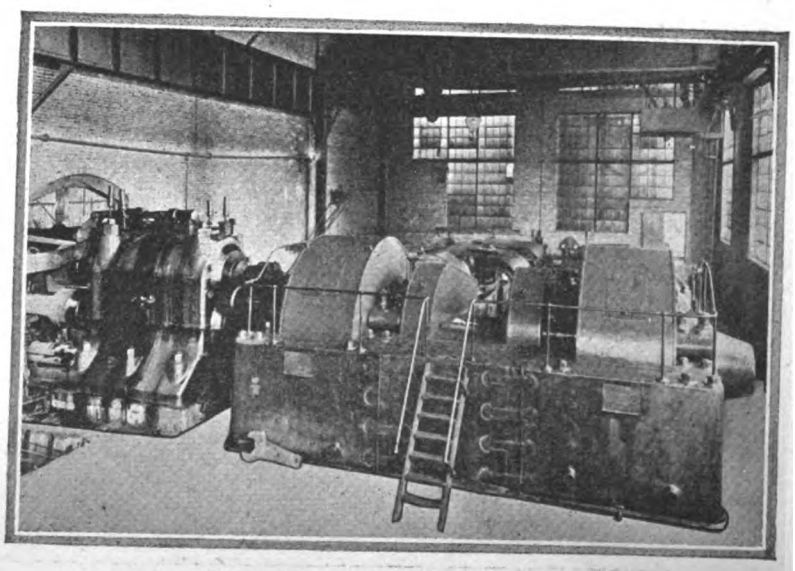


Another way of keeping oil in the machine shop. Here, the tank is stationary, and is so placed as to be accessible to the workers with minimum loss of time.



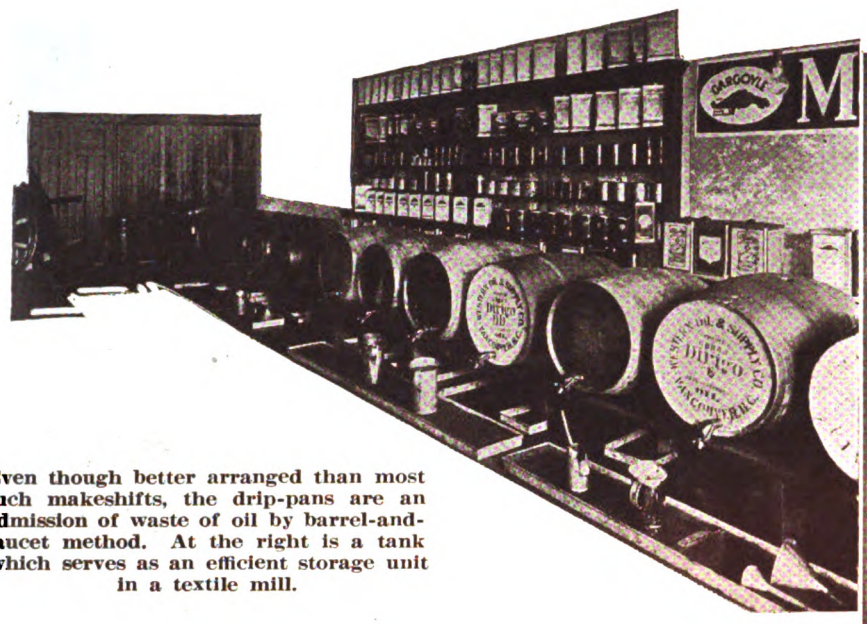
One of the units of the automatic oil circulating and filtering system which lubricates the engine shown at the extreme right.





Large twin tandem compound reversing engine at the plant of the Weirton Steel Co., Weirton, W. Va., lubricated by continuous stream of cool, clean oil.

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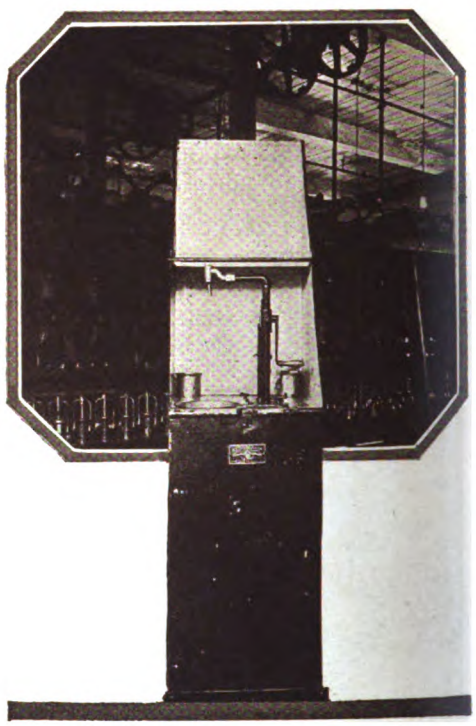
Even though better arranged than most such makeshifts, the drip-pans are an admission of waste of oil by barrel-and-faucet method. At the right is a tank which serves as an efficient storage unit in a textile mill.



Any storage method that involves manual transportation of this sort, is wasteful of both time and oil.



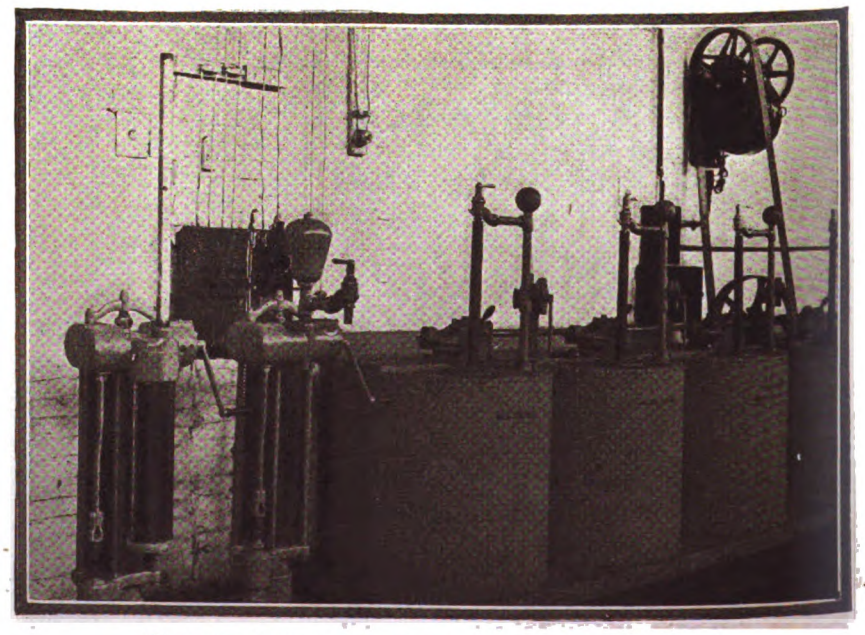
Many barrels are supposed to be empty when the faucet stops running. This makes oil salvage from empty barrels a profitable business in large centers.



Cabinets like this do away with unnecessary manual transportation and keep the oil always clean.

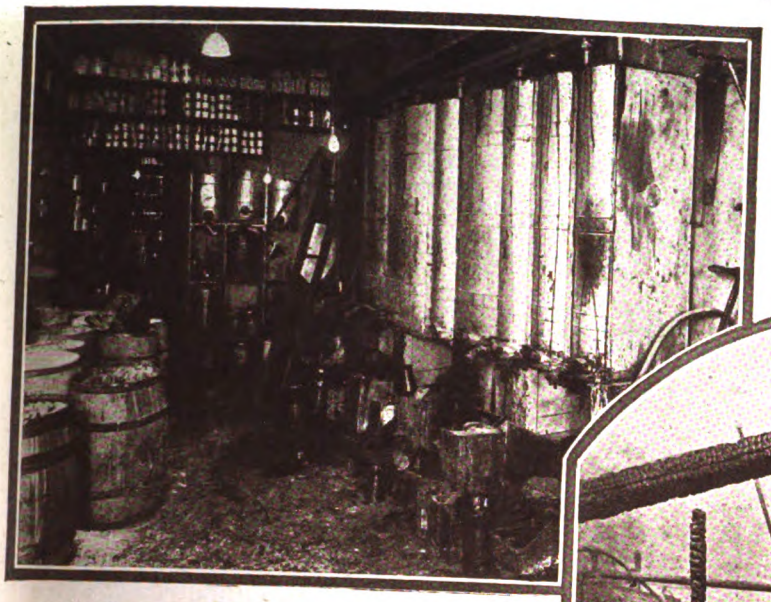


Part of the equipment of a large paint manufacturer. The oils—of which a variety are required—are piped where needed, and can be drawn off in measured quantities without waste.

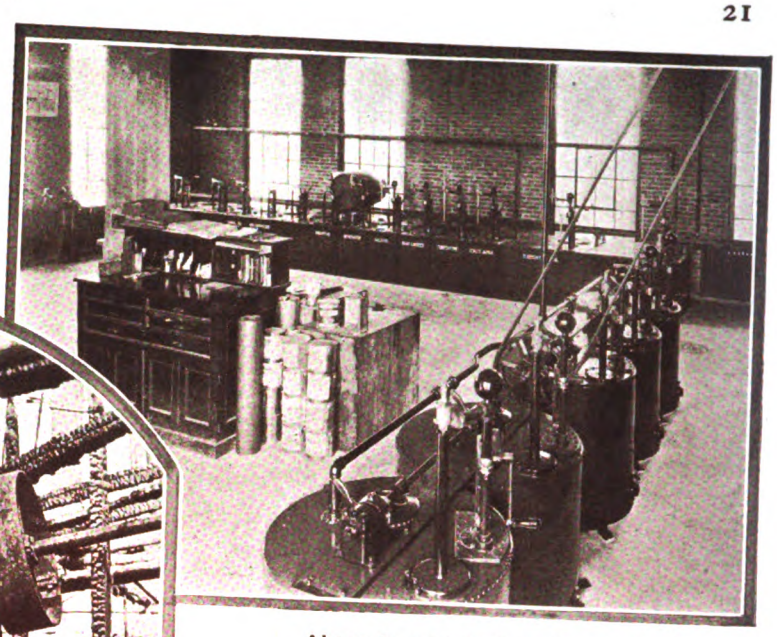


Part of a battery of tanks at the same plant as shown at the left. These tanks are for storing paints, and are equipped wih rotary agitators to stir the paint before drawing for use.

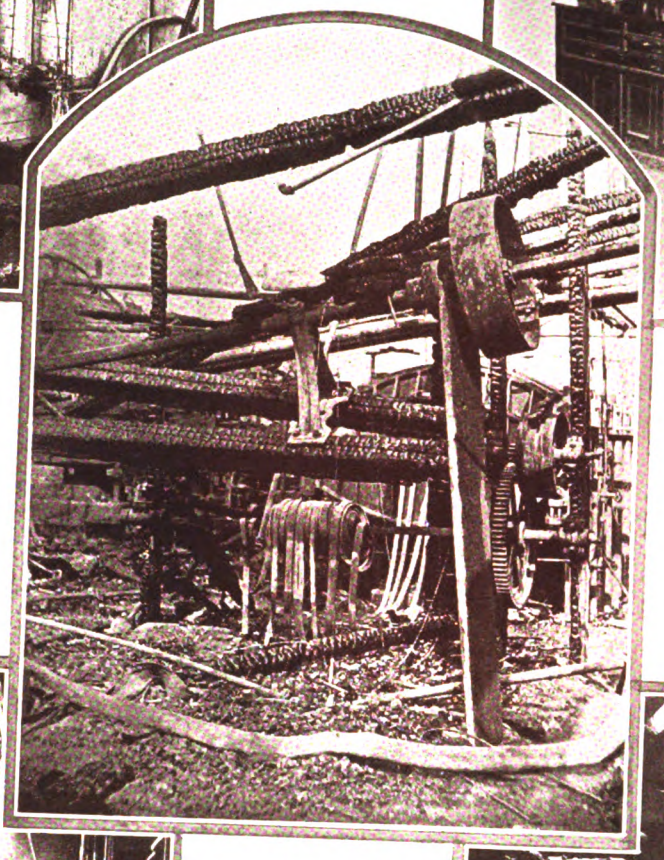
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At the bottom of the opposite page is the answer to this method of storing paint oils. Yet the above is by no means an unusual sight today in quite a number of places.



Above is a typical modern central oil house. The larger quantities of oil are stored underground, and pumped to this floor for distribution. Mixing, storing and measuring tanks for paints in the foreground.



Below—once fire gets a start in a place like this, it is practically hopeless to try to salvage anything.



Below—instead of adding to the fire-risk, these tanks went through the fire without allowing their contents to burn.

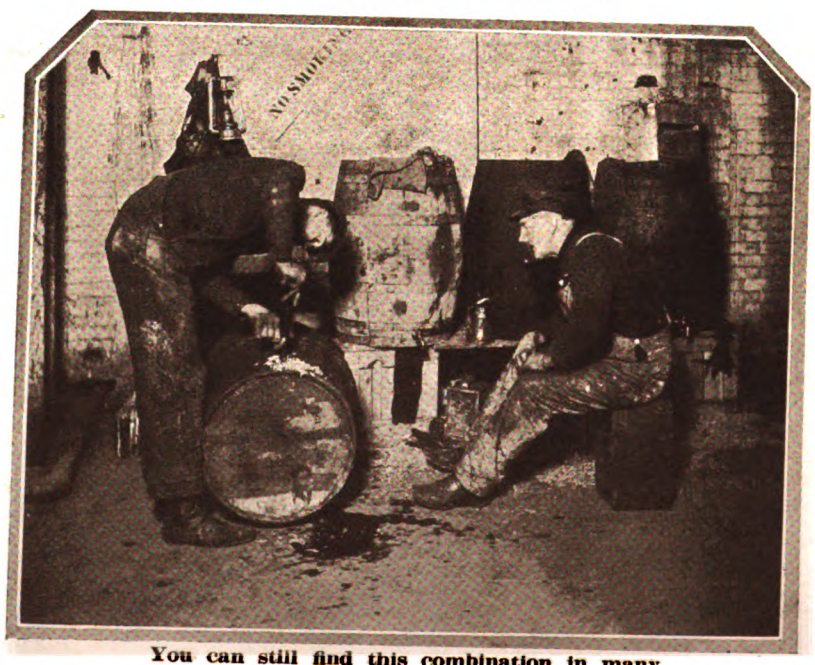


Panel insert above—all that was left of a factory where oils were stored "any old way."

Old Man Hopkins; and they aren't by any means confined to out-of-the-way country stores; many of them are, in fact, managing executives of otherwise thoroughly modern, well-equipped plants. Why they keep on neglecting such an important matter as the handling and storage of oil, is just as much a mystery as why a man will spend hundreds of dollars repairing an old car when a new one would cost less and give better service.

It still is common practice, though growing less so as consumers become educated to better methods, to ship oils to the consumer in barrels or drums. This method naturally suggests that the containers be used as storage units, rather than to transfer their contents to some other container. Right here is an example of where the easiest way is the most expensive way, because of the ever-present fire risk, and because of the inevitable waste through leakage, evaporation and the immense time-loss.

Bulk storage of oils, where large quantities are used, makes possible an immense saving in cost through quantity buying, as well as the not inconsiderable saving in handling cost—since tank cars empty direct into the large storage units. Even where oil is used in smaller quantities, the immediate emptying of barrels and drums, and their return for credit, means a saving well worth while. But the pictures tell the story without need of further comment.



You can still find this combination in many places; the "No Smoking" sign, and the workman with lighted pipe next to an open kerosene barrel.

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How the Big Executive Keeps Fit

The Importance of Health as an Aid to Success

By D. M. Dunn, M. D.

THERE are two types of executives which seem to stand out among American business men. One is the big, blond, rotund individual with a hearty laugh, a breezy force, a tendency to overweight and high blood pressure. The other is the lean, wiry man, high strung apt to go on his "nerves," with a tendency to over-work and over-stimulation, to dyspepsia and insomnia.



These men, who are the great commercial assets of the country are highly geared engines, apt to wear out unless well cared for. Unprotected by the knowledge and practice of hygiene they are apt, after forty-five, to fall victims to some serious impairment which results in an abbreviation of creative ability.

That such tragedies are not inevitable is demonstrated by

(*Continued on Page 50*)



Blood-pressure test is not something solely for sick people, but is valuable as an advance indication of something that needs attention. A man is "as old as his arteries."

Contrast this example of good posture with the slouchy one shown below at the right.



The white area at the root of the tooth shows a focus of infection which is pouring poison into the system. The British Premier recently was incapacitated by one of these "little" things.



This chap may consider himself more comfortable than the one above; but his lungs, heart, liver and intestines are going to make him pay, later, for cramping them.



The man who closes a sale is under tense strain, mental, physical and nervous. He cannot afford the handicap of ill-health.

The still-life, below, is not only good to look at, but should form a large part of the diet.





There's a certain buoyant optimism about a man in good health, which reacts favorably on those with whom he wants to do business.

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Building Sales by Intelligent Packing

The Packing Engineer not only Cuts Costs, but Builds Good Will

BY E. W. DAVIDSON

FIVE hundred thousand dollars lost every year by bad packing! American shippers may gasp but the U. S. Forest Products Laboratory at Madison, Wisc., insists upon that figure. The laboratory has long kept a trained eye on the matter of American packing. It knows whereof it speaks and in speaking, it points out a way for business to plug up an expensive leak in these days when expensive leaks cannot be tolerated.

The laboratory's advice about packing is not being neglected. Industry is developing a new profession to help accept that advice. The packing Engineer is beginning to make himself felt. No longer is a box and a crate merely a given number of boards nailed around a product to be shipped.

The new science of packing is working out exact specifications for the size and thickness of lumber to be used, the sort of nails for each kind of container and the proper way to drive them, the most ingenious method of making each product compact and well balanced within its container, and a thousand other things.

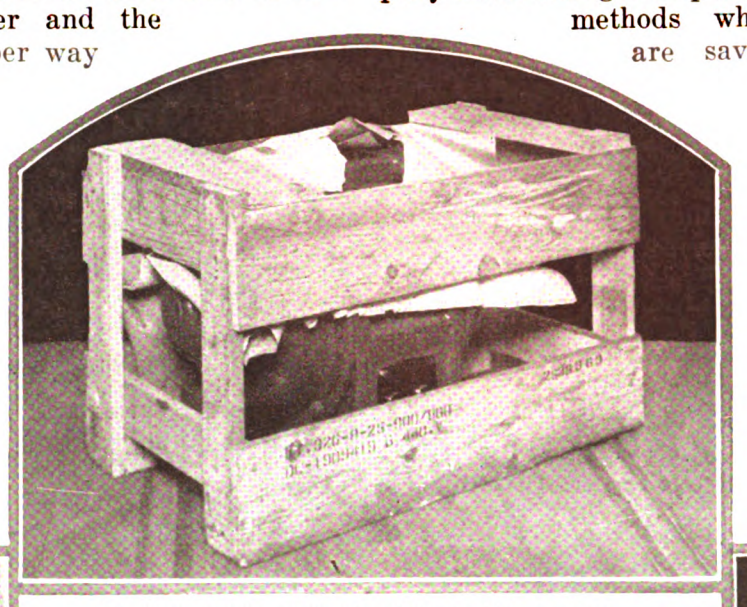
It pays. This year a packing engineer in six weeks' work for an electrical appliance company made changes in packing methods which are saving $30,000 a year on that company's exports alone, not to mention great economies in domestic shipping. By substituting straw board and corrugated board bent cleverly into shape, to support various types of products within their boxes, he was able to cut exactly in half the company's monthly bill for old newspapers formerly used for box stuffing. With that same sort of board he displaced great quantities of excelsior and sawdust which had unnecessarily occupied space and never could be depended upon to keep an article safely in the center of its box.

These savings in carton and box space not only reduced the cost of packing materials but

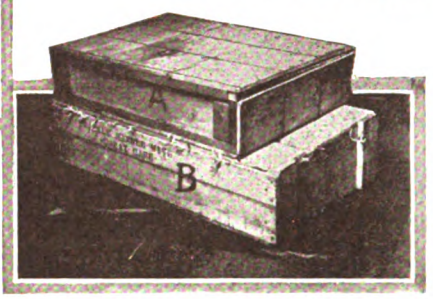
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A little ingenuity in disassembling and supporting cut the cost of this package in half.



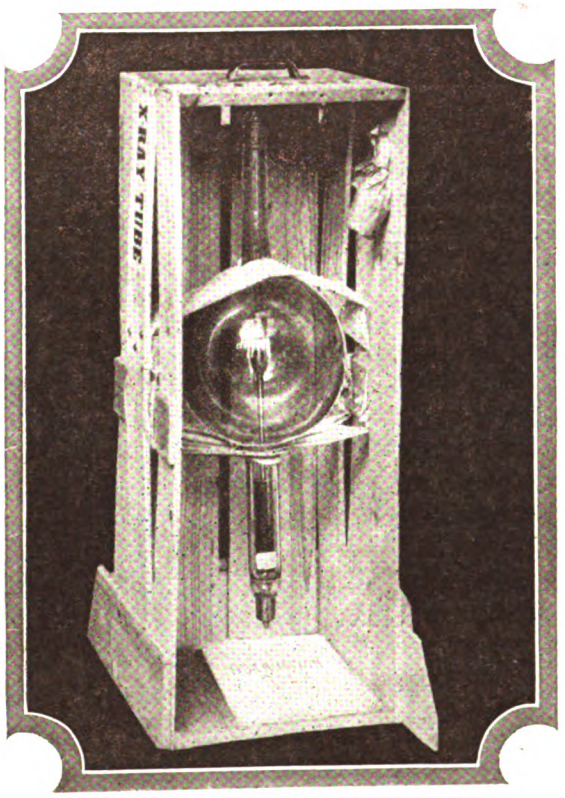
Three-way corner construction enables a crate to resist strain from every direction—and the shipment arrives intact.



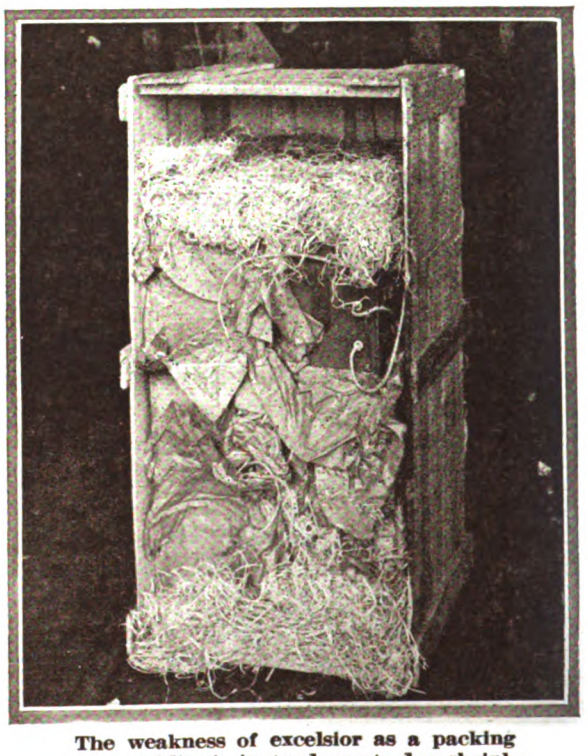
The new box (marked A) saved $134.25 in the packing and shipping of 1600 electric stoves for export.



A testing device which permits loaded barrels to be dropped from any height at any desired angle, so that their fitness for the contemplated use may be determined.



This scheme of slinging an X-ray tube inside an open, light-weight box, instead of packing in a solid closed box of heavy construction, has saved much breakage because handlers can see what fragile stuff they are handling.



The weakness of excelsior as a packing material lies in its tendency to dry, shrink and pack down. Frames and props of fibre board are stronger, cheaper, and usually more economical of space.

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Handling Steel on Electric Cars

How One Big Plant Solves Its Intra-Factory Transportation

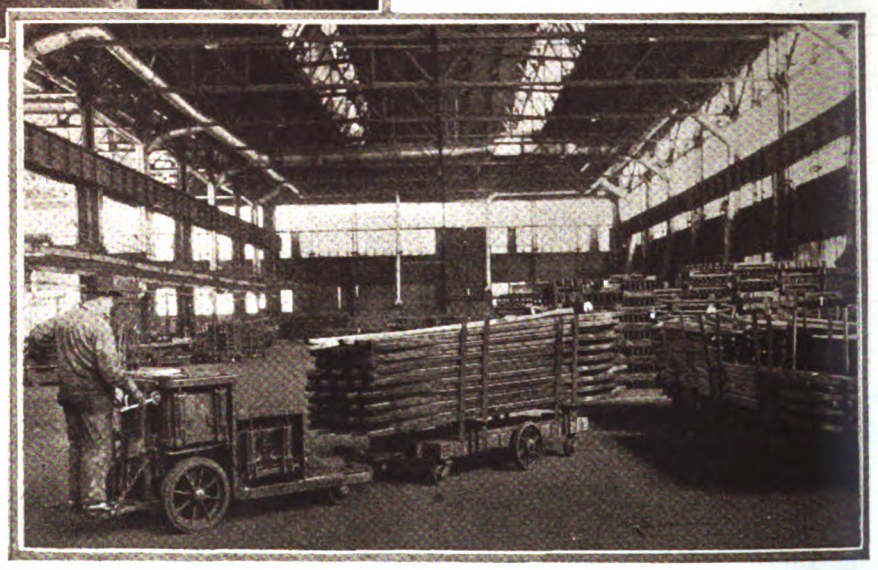
By W. E. Irish

MUCH has been said and written concerning the handling of sheet steel in storage, and the application of electric tractors and trucks to the problem of transporting materials in process through the average factory. Nevertheless it is a fact that even though a great many plants, today, have equipment for the purpose, only a part of the possible saving that could result from their best application is being obtained. Since the methods for handling steel in storage are so different from those employed in transporting parts in process through the factory they will be dealt with separately, the transportation problem being taken up first.

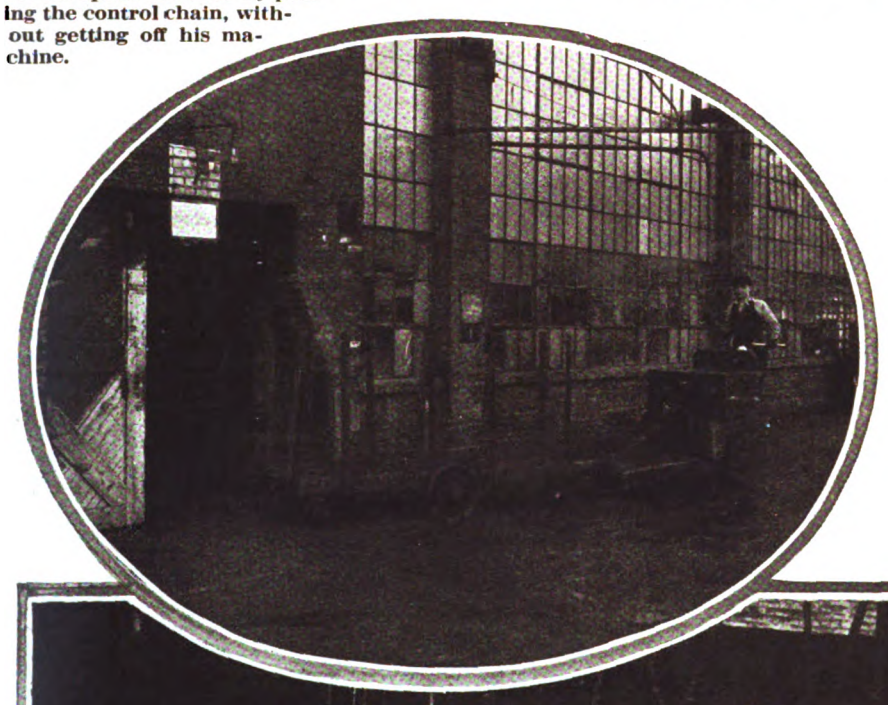
Credit is due Mr. J. H. Foster, president of The Hydraulic Pressed Steel Company for having conceived of one of the earliest, if not the first, plans of using the storage battery truck as a tractor to haul materials on trailer trucks, through the factory, from one operation in the process of manufacture to the next. To Mr. Patrick Culhane, the plant superintendent, is due the credit for devising the actual method of application, so different



Above is shown one side of the tractor garage, with stands for batteries, and battery charging panel, at the rear.



A truck-load of formed parts being pushed into stock storage ahead of assembly. Note how cross-stakes raise the load and also that overhanging load does not interfere with tractor.

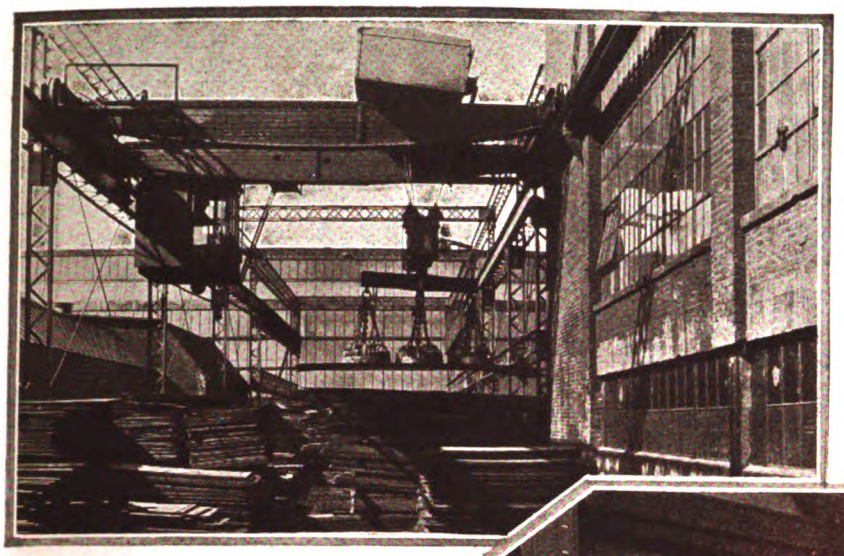


An empty truck being pushed into the shop from the yard. The operator opens the door by pulling the control chain, without getting off his machine.

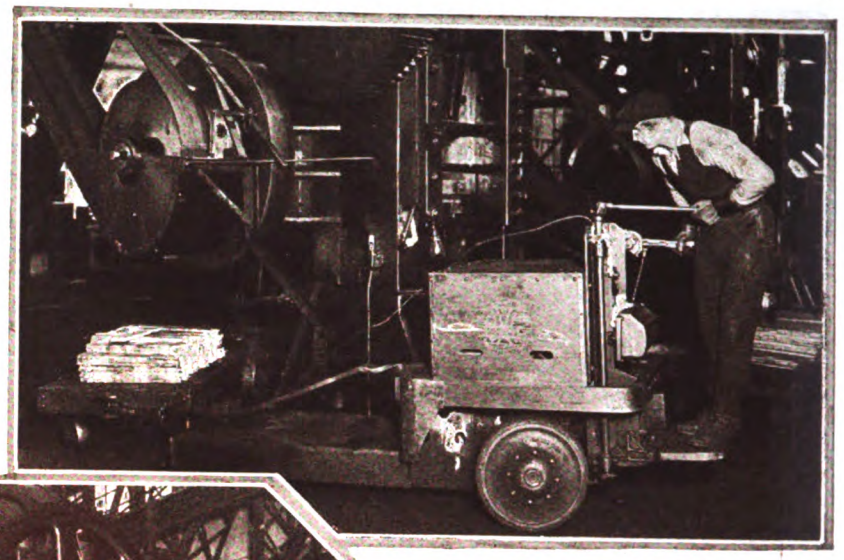


The operator is here removing a loaded trailer from the pickling vats. Close corners and narrow aisles are readily negotiated with this system.

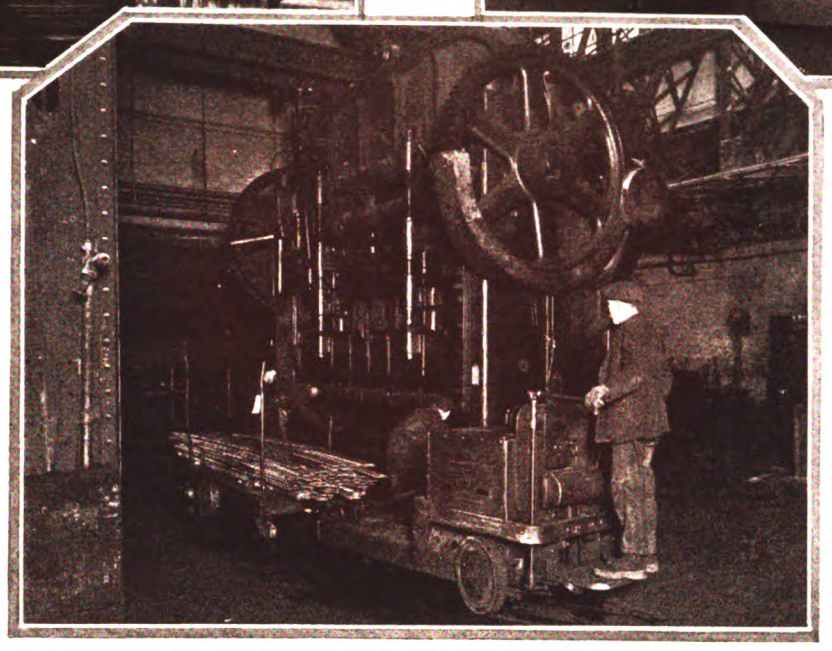
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The magnet crane over the steel yard, with a load of 48" by 180" sheets ready for delivery to the truck shown at the lower right-hand corner of this page.



Placing a truck behind a press, where the operating space would make such a feat impossible with any other style of equipment.



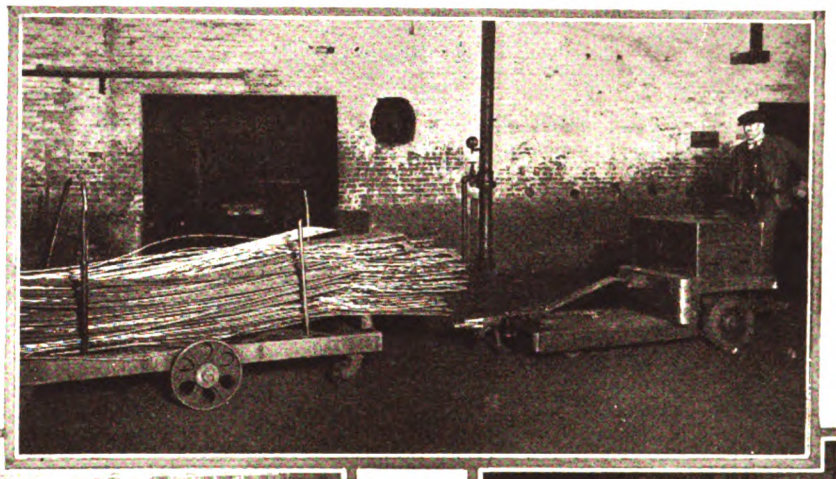
The tractor is here placing the truck beside a punch press for the second operation. Below is a tractor about to couple on to a truck. The coupler mechanism and the design of tractor front admit of a considerable load overhang.

from the usual present day practice, that makes the system really efficient. Handling of steel from cars to storage and from storage to production, using the efforts of only one man, are also of interest and will bear close study on the part of those having a similar problem.

Up to the year 1910, all materials in process through the various departments of the plant, were handled by hand. From storage they were piled on the floor at the machines, through the machines they were run to the floor again, and from there loaded by hand to push trucks and once more piled on the floor at the next operation.

During 1909 the company was fabricating the frames for the Ellwell Parker double end, low center, baggage carrying electric trucks, along with the other pressed steel parts and automobile frames regularly manufactured. Mr. Foster conceived the idea of cutting this frame in half across the center and making a complete machine of the half section by mounting a pair of wheels under the low section. The form of machine he thus obtained is essentially the present day lift type truck without the lift mechanism. His idea was to use this unit, not to carry loads ——because the available area of platform was much too small for the class of material handled—but to move trucks loaded beyond the capacity of a man to push from one point to another. Accordingly arrangements were made with Ellwell Parker, and the Lakewood Engineering Company and the first tractor and trucks were made to his specification, and put in service. This equipment was turned over to Mr. Culhane to get into operation. With his initial efforts, and after eleven years of de-

(Continued on Page 32)





Above is a view of the tractor, showing the special coupling device with release cord running to within the operator's reach.



Placing one of the special sheet-carrying trucks for a load from the steel yard to be run through the shears.

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What Germany Offers Her Blind

Training Sightless Workers for Self-Supporting Jobs

By Hubert Hermanns

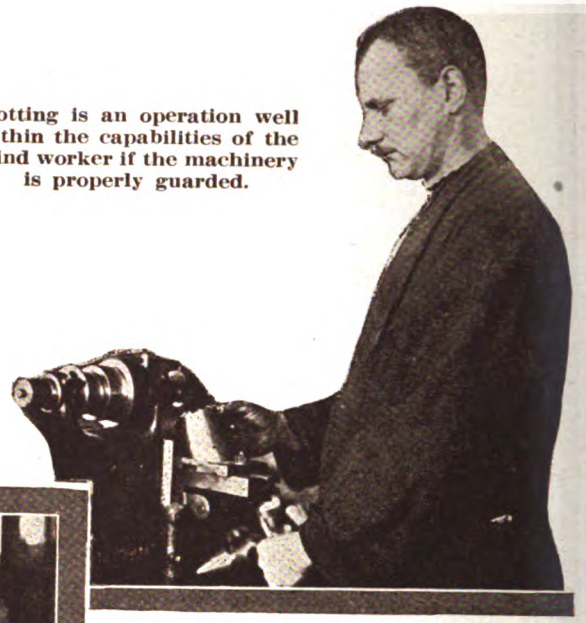


Lathe work, to a former mechanic who has lost his sight offers more attractions and better pay than the making of brooms or baskets.

THE problem of the employment of persons born blind or who have lost their eyesight subsequently, is as difficult of solution as it is important. The difficulty arises from the fact that in almost all human occupations the eyesight is the first consideration. The importance of the problem will be appreciated when it is stated that in 1914 there existed in Germany alone 34,000 blind, who were as a rule taken care of in asylums for the blind and were here occupied somehow or other, although in a manner which could hardly strengthen the will to live. Occupation consisted, as a rule, in the manufacture of brushes, basket work and the like, products which, as typical of the blind, were distributed by benevolent associations or by the asylums themselves. As the blind seldom came in touch with their happier fellow-creatures, public interest in a fundamental improvement of their conditions was not very great.

Then the war came. It not only made a strong appeal to general sympathy and fellow-feeling, but it demanded peremptorily that soldiers who had been fighting for their country and returned home

(Continued on Page 53)



Slotting is an operation well within the capabilities of the blind worker if the machinery is properly guarded.



Below—the blind develop a manual dexterity which goes far to compensate for the loss of sight.

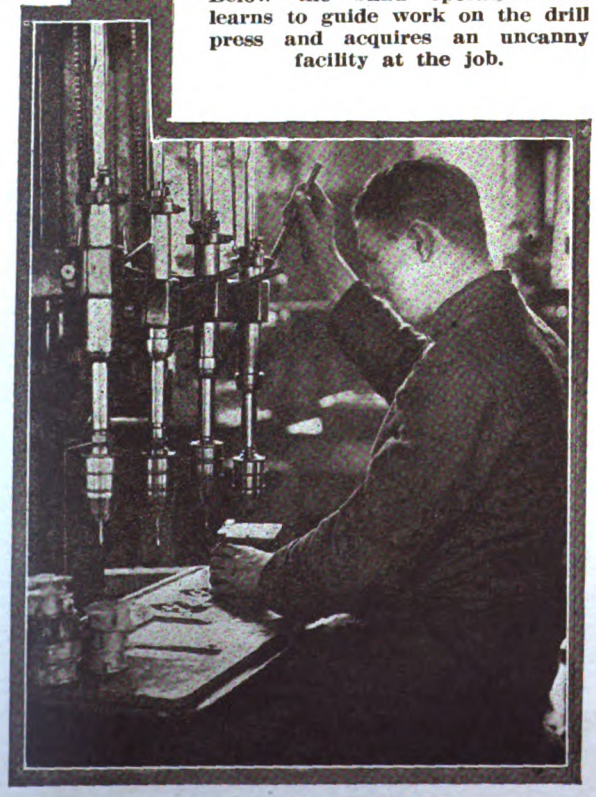


Checking screw-threaded sleeves for fuse plugs by the aid of a hand-operated crank which carries the thread-gage.

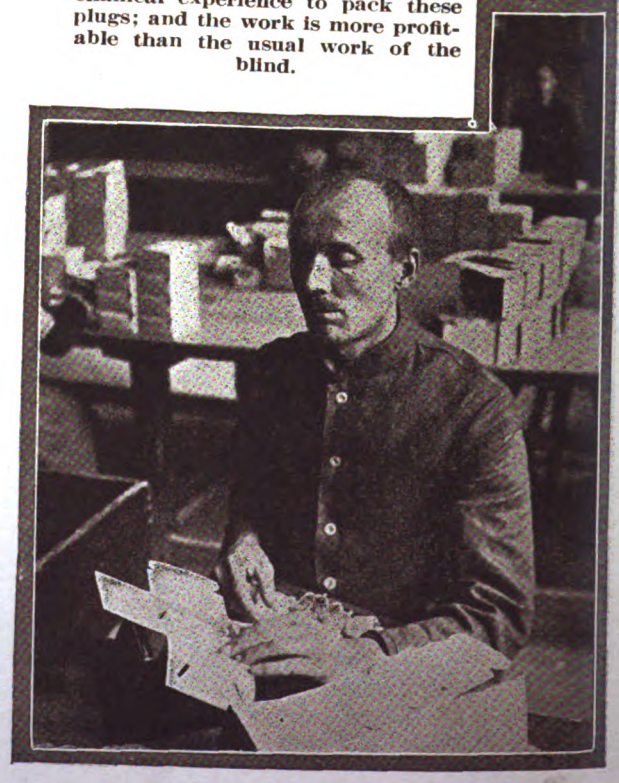


Below—from the posture one would imagine that this man's gaze is concentrated on his work; but he works by touch alone.

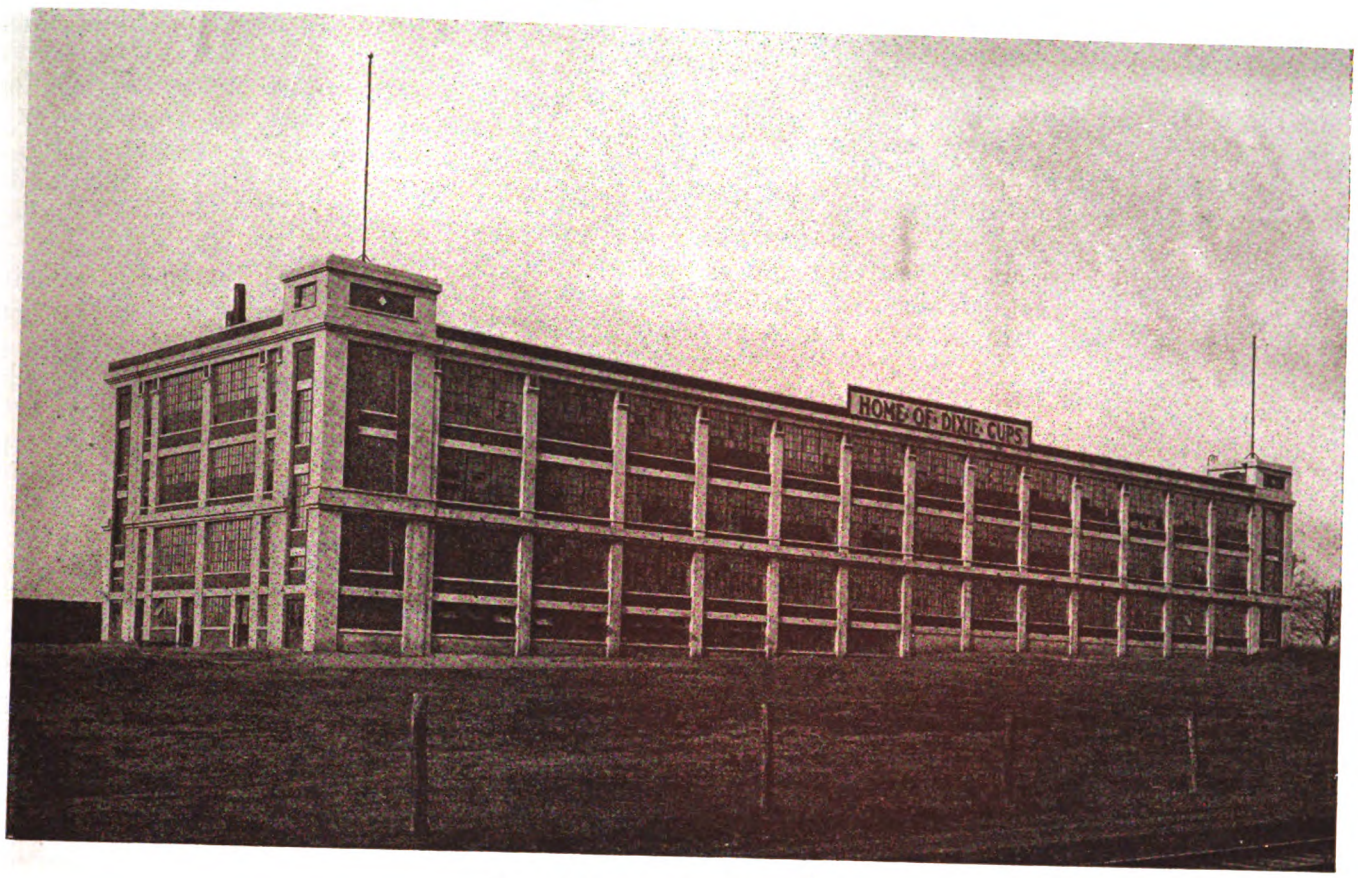
Below—the blind operator soon learns to guide work on the drill press and acquires an uncanny facility at the job.



Below—it requires no previous mechanical experience to pack these plugs; and the work is more profitable than the usual work of the blind.



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Plant of the Dixie Drinking Cup Co.

Easton, Pa.

Edward Pendlebury, Engineer

And THE DIXIE DRINKING CUP CO. said: "Let WHITE build it of CONCRETE"

WHITE is not a local organization. *WHITE—constructed* concrete industrial buildings are to be found in many prominent locations along "Main Street." Wherever you contemplate erecting your new plant, whether in New York or at some distant point, *WHITE* can serve you well and at attractive figures.

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CONCRETE "WHITE" CONSTRUCTION CO. INC. NEW YORK

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Building Sales by Intelligent Packing

(*Continued from Page 23*)

cut a large and happy figure in the item of ocean freight, which is based on cubic contents in most cases.

If there is one man in a factory able to show his worth to his company in dollars and cents saved, it is the packing engineer, the man scientifically trained in this new profession. In going over a company's old packing procedure he usually is able to substitute lighter and less costly lumber and materials by changing a box design to meet the new set of scientific specifications, and simultaneously he is reducing the time necessary to pack a box and the cost of cartage, storage and insurance on the goods in transit, all in addition to cutting down that staggering bill for goods smashed enroute.

Some wide awake concerns have employed the few available packing engineers of the new order and a handful of industries have gone so far as to establish laboratories for these men to use. In these laboratories—all copied more or less closely after the box testing department of the government forest products laboratory at Madison where studies are continually being made for shippers everywhere—there is usually a variety of equipment for subjecting containers to all sorts of indignities. Every test imitates some shock or strain which containers must be able to withstand while enroute.

Tumbling boxes of glassware around in a great, steel drum isn't idle play. While the experts stand back and look on, these six boxes, representing six ways of packing that particular glass article, go bumpety-banging until they break up. The onlookers see exactly how each performs under all sorts of conditions and, by this means, substantiate in practice what they had figured out in theory.

The best made box thus can be chosen and, although $2000 worth of glass was smashed in a single day in such a drum, yet how much more expensive—and how much less educational—it would have been had the manufacturer tested out box after box by putting them into actual use in carload lots!

Containers are tested under compression, cornerwise and at various other awkward angles, to show just how much weight they can stand in freight car or ship's hold. They are dropped and tumbled around mercilessly on concrete floors just to see how much they can stand. It appears crude but every test is scientific.

To design boxes that can stand the racket, exact standards for every detail have been worked out by the United States Forest Products Laboratory, by groups of railroads, by the National Association of Box Manufacturers, by The American Society for Testing Materials and other such organizations. Containers that do not conform are weak or else are far heavier and costlier than they need be to possess a given strength.

There is the matter of nailing, for instance. You wouldn't think there was anything intricate about putting the lid on a box. You might not know offhand that cement coated nails hold thirty per cent better than smooth nails. Also you might be ignorant of the fact that this holding power is fully fifty per cent greater when the nail is driven across the grain than into the end of it. And that nails' holding power varies widely between basswood and beech—(its variations according to the density of woods are computed with some accuracy) and that a nail over-driven by so little as a single wallop of the hammer loses from fifteen to forty per cent of its hold due to the crushing of the wood fibre by the nail head.

Not every packer of the old style knows that he should spot his nails in evenly staggered rows, when cleats are used at box ends, so that approximately half of them reach into the cleat and the other half into the end.

And above all, he may not know how to determine nail sizes and spacings with respect to the thickness and kind of lumber used. In the first place, the packer classifies woods according to their density so that the common ones group thus:

Group I: Alpine fir, aspen, balsam fir, basswood, cedar, cottonwood, cypress, Norway pine, spruce, yellow poplar, etc.
Group II: Douglas fir, hemlock, larch, Southern yellow pine, etc.
Group III: Black ash, black gum, maple, (soft or silver), red gum, sycamore, white elm, etc.
Group IV: Beach, birch, hackberry, oak, rock elm, white ash, etc.

Then based on these groupings, he follows this table of nail gauges, arranged by the National Box Manufacturers Association:

Use cement coated nails of gauge indicated. When species of wood holding points of nails is:	Thickness of ends or cleats to which sides, tops and bottoms are nailed.							Thickness of sides to which top and bottom are nailed.			
	3/8" or less	7/16"	1/2"	9/16"	5/8"	11/16" or 3/4"	13/16"	7/8"	* Less than 1/2"	1/2" to 9/16"	5/8" to 7/8"
Group I	4d	5d	5d	6d	7d	8d	8d	9d	4d	6d	7d
Group II	4d	4d	5d	5d	6d	7d	7d	8d	4d	5d	6d
Group III	3d	4d	4d	5d	5d	6d	7d	7d	3d	4d	5d
Group IV	3d	3d	4d	4d	4d	5d	6d	7d	3d	4d	5d

* Only in exceptional cases is side nailing recommended when the thickness of sides is less than 1/2".

Having thus chosen the right size of nails, the packer spaces them according to this rule: In nailing sides, top or bottom to ends, six penny or smaller nails should be spaced not to exceed 1½ inches apart, when driven into the side grain of the box end, and not to exceed 1¼ inches apart when driven into the end grain of the end. With nails larger than six penny the spacing should be increased one fourth inch for each penny over six.

In nailing top and bottom to sides, the nails should be spaced six inches apart when the nails are six penny or smaller, increasing the spacing one inch for each penny over six.

Strapping a box also is an unsuspected art, as packing engineers have proved. Strap of one kind or another is often necessary for heavy goods or for large containers whether the load be light or heavy, and should be put on practically every export box.

Plain, flat unannealed steel strap coated to prevent rust, is preferable to annealed wire or iron strap for most uses, because its tensile strength is thirty per cent higher, and it is less likely to stretch or break. Of course a stretcher must be used in applying any sort of banding metal, for the whole value of banding lies in its constant grip. It must be tight, also, to prevent its festooning in cases where the lumber in the box, shrinks. A band should be placed around each end of a box, parallel to the ends.

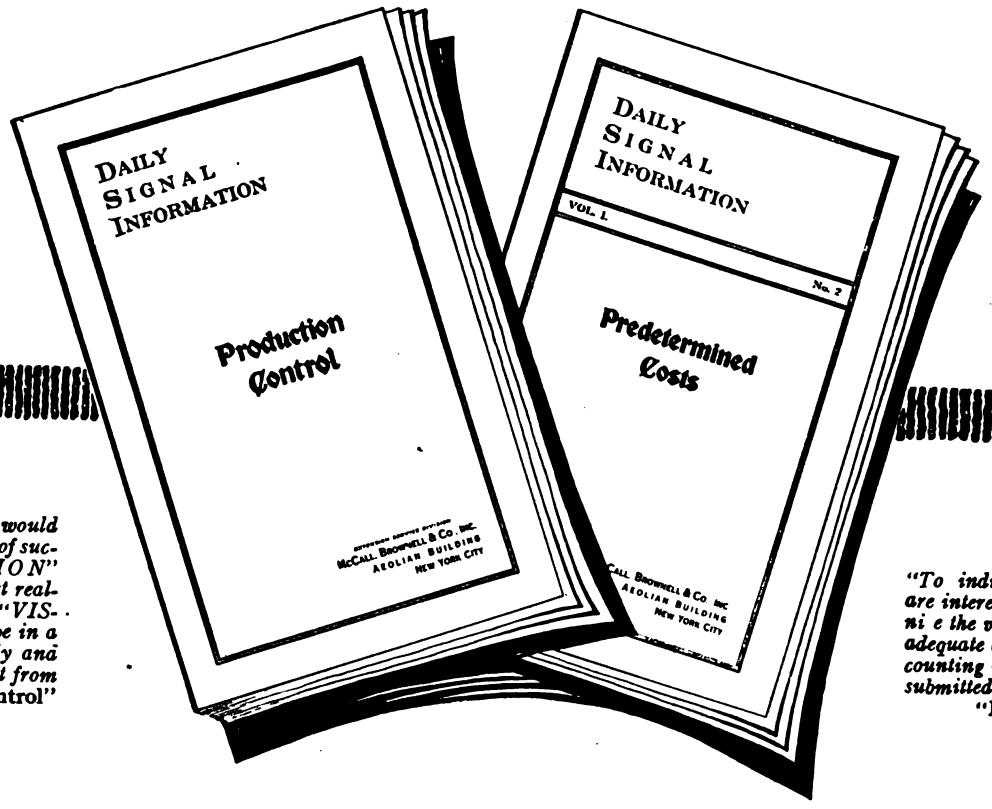
The thickness and width of the strap depend upon the size, gross weight, construction and contents of the container. In general, a half inch strap, 0.18 inch thick, is satisfactory for boxes up to one hundred pounds. Heavier boxes may need five-eighths by 0.20 or three-quarters by 0.15 strap, either of which has a tensile strength of about 1200 pounds.

The kind of lumber to be employed is, contrary to general belief, not as important from the standpoint of box strength as the type of nailing and fastening to be used. Almost any species of wood will serve, provided it is properly seasoned and has few if any, defects.

Lumber used green will ruin the best job of nailing and strapping, for as it dries, it shrinks. If it is seasoned down to general atmospheric conditions—12 or 18 per cent

(*Continued on Page 30*)

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"To the executive, who would attain the fullest measure of success, "VISUALIZATION" must be a creed. He must realize that only through such "VISUALIZATION" can he be in a position to plan accurately and direct effectively." Excerpt from
"Production Control"

"To industrial executives who are interested in, and who recogni e the value and importance of adequate and proper Cost Accounting methods, this booklet is submitted." Excerpt from
"Predetermined Costs"

Production Control

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FOREWORD
"VISUALIZATION"
WHAT DAILY SIGNAL INFORMATION WILL ACCOMPLISH
A WORD CONCERNING FUNDAMENTALS
ESSENTIAL REQUIREMENTS FOR SUCCESS
METHODS WHICH PROVIDE DAILY SIGNAL INFORMATION
IN GENERAL
AS APPLIED TO PRODUCTION
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Predetermined Costs

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PRE-DETERMINATION OF THE MATERIAL FACTOR
STORES AND STOCK CONTROL
CONCLUSION

These booklets are a compilation of suggestions, to aid in analyzing problems and to assist in the checking of plans for their solution with the proven advantages in procedure and methods developed in our thirty years of experience in assisting hundreds of enterprises to greater production and greater profits.

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Aeolian Building, New York

Industrial Engineers **Organization Specialists** **Analytical Accountants**

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(*Continued from page 28*)

moisture content—if there are few knots, season checks or openings in the grain and if these few are so placed as to have slight weakening effect upon the container, then it is not so important whether the wood is oak or pine. The packing specialist will pick the species his company can buy cheapest and design the thickness of his pieces to suit.

The sizes and thickness he decides upon are important. Standard commercial sizes should be used wherever possible for economy's sake. The wider it is the better, because wide boards give a box more rigidity and a defect is less likely to cause a break. Thicknesses are determined not only according to the size of the box, the weight of the product and the amount of support the product gives the box sides, but also upon the species of wood. Extra thin material usually must be of the hardwoods such as beech, birch, maple, ash, oak or gum, regardless of how light the load is to be, for nails must have something substantial to hold to, even if the container is filled with nothing heavier than hats.

The specialist also hopes to reduce pilferage. Proper strapping around box ends interferes greatly with the pilferer with his nail puller.

If the padding or bracing inside the box is properly chosen and arranged, the weight and size of the package may be reduced. Corrugated board bent to fit odd shaped spaces, has saved many a manufacturer heavy costs of paper and excelsior. Used as partitions, this material is often better than wood for it is of high resistance and does not shatter as easily as wood.

Often the whole style of packing a product may be changed to great advantage just as the U. S. War Department in 1917 and 1918 saved fifty million dollars in ocean rates on textiles, such as socks and officers' uniforms, by baling them instead of boxing.

Also the question of damage by weather, and stevedores' hooks must be considered. For bales, fiberboard testing not less than two hundred pounds to the square inch, Mullen test, wrapped around the bale under the burlap or canvas cover is excellent hook protection. If the bales are kept down to 140 lbs. and have ears on the corners, fewer hooks will hit them.

In order to make boxes and crates waterproof the old style method was to "make her tight." But not today. Boxes must have side holes to allow the product to "breathe" with changes in temperature, instead of collecting water by "sweating."

Products should be wrapped in waterproof paper. The War Department, followed by many industries, uses duplex paper made of two thirty-pound sheets of No. 1 sulphate kraft basis, 24x36-480, cemented together with asphaltum. This makes an absolutely waterproof lining for a box. It is strong and can be folded without breaking the waterproof coating.

A number of tough, pitch-impregnated papers and canvases have been produced in which a product can be wrapped inside its box or crate. In the case of the canvas, the wetter it gets, the closer it hugs the product. It does not crack in cold or melt in equatorial heat. If a hole is punched in it, the edges adhere to whatever surface is near enough, thus sealing up the rent.

Often double boxes are used, the inner one floated or braced in the outer. In this case holes can be bored in both boxes, and if the holes are offset the danger of water running into them is slight. For export shipments these holes ordinarily are screened to exclude vermin.

Sometimes these holes in double boxes are put there to keep the product cooled. Rolls of varnished cambric packed closely in an inner box once gave their maker trouble by catching fire from friction. the ventilating holes remedied this difficulty.

The packing designer must think of all sorts of things beside merely the tightness and strength of the container, if he would land his goods safely at the other end of their journey. Take the fragile X-ray tubes which are shipped all over the world. Once they broke en route, with the frequency of eggs. This was in spite of the big red "Glass" and "Handle with care" signs plastered on them. There seemed no packing soft and resilient enough to save them.

Then psychology was tried on the expressmen. Instead of nailing up the tubes in big, strong boxes, thin, springy wood was used, and each tube was slung on tight strips of ticking inside an open crate.

Any handler could see the delicate looking glass tube, the size of a man's arm, inside. The effect was good. A look at the product, plus the mental effect of a little two-finger handle at one end of the crate, cut down tube breakage tremendously.

The packing engineer's work may range from such subtleties as this, to the job of properly anchoring on flat cars massive castings the size of a box car. He must fit his shipments to meet all the difficulties enroute.

A packing engineer has been doing excellent work for a big concern lately. He was able to save a cent a box here and a cent and a half there; re-arranging the packing of one article so that six now occupy the space of one; changing the standard package quantity of another article from twenty-five—an awkward number to pack—to twelve, which cubed up neatly; devising a way of bracing a fragile article securely, instead of stuffing it insecurely; and cutting down the time, effort and inaccuracy of workmen.

In his report on a subsidiary company's packing he pointed out that the lumber then used was entirely unsatisfactory from every standpoint. Most of it was cull stuff, absolutely unfit for packing purposes. It contained checks, splits, rot, loose knots, raised grain, and was very brittle. He recommended that its use be discontinued as soon as the supply was used up and that yellow pine be used in its place. The yellow pine should be equal to "sound, tight knotted stock, Box Grade or better."

He said the box strapping then used was soft and too weak. Although this was waste material and did not cost anything, nevertheless he said it was expensive because it caused so much loss. He recommended that its use be discontinued and that *unannealed* steel strap be used.

"Since standard sized export packages are being adopted" his report reads, "it is recommended that made-up case-linings be used with all seams cemented, instead of sheets cut to fit the case. It was noticed that much paper is being wasted by using sheets because the packers always tear off too long a sheet so as to be sure to have enough. Also, lining a case with sheets does not make a case tight enough for highly finished appliances where rust is so important a factor. It is believed that possibly slushing could be discontinued on export shipments if these case linings were used."

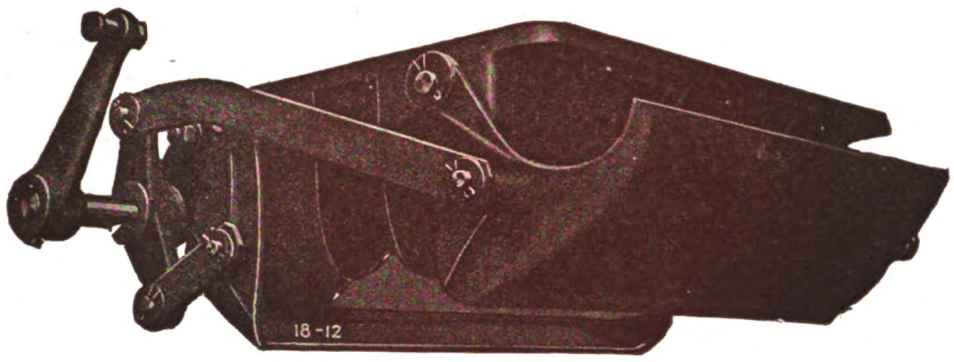
Touching on the question of weighing and marking shipments, he reported: "It is very important that *each and every* export package be weighed individually owing to the strict customs regulations regarding the declaration of wrong weights. Some countries permit only two per cent variation between the weight as stenciled on the case, and the actual weight as received at Customs House. In many instances the weight of two cases will vary more than two per cent even though they contain the same material, and are of the same size, due to variation in the weight of the case. An average weight should never be used on export shipment."

Thus it is evident the modern packing engineer is a good deal more than a nail driver. He is a draftsman, an inventor, a research expert and authority on domestic and foreign traffic. His profession is only beginning to win recognition, but enough concerns have given that recognition to put the profession on an equal footing with other kinds of engineering. And the laboratories these concerns have established are doing their bit to reduce that startling $500,000 a day to less frightful proportions.

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Handling Steel on Electric Cars

(*Continued from Page 25*)

velopments along lines that he laid down, a really efficient system has grown.

There are definite passageways through all departments, along which materials are constantly passing in an orderly manner. Nothing touches the floor from the steel storage to the point of shipment. Press operators unload and load the trucks directly through an operation, and eight tractors, each carrying one man, readily handle all the requirements of transporting and accurately placing the entire output through one shift. They move thousands of tons of material a month and release for direct production work over a hundred men.

The present equipment consists in:

Eleven tractors, of which seven are Ellwell Parker of the same design as the first purchased, a design that is now obsolete with them. Three are Baker lift type electric trucks without the lift mechanism, and of their latest design. One is a Baker standard heavy duty tractor.

Thirty-three trays of twelve-cell batteries, of which thirty-one are Exide, and two are Edison.

Eight hundred and fifty trucks, of which about six hundred were made by Lakewood Engineering Company, one hundred by Atlas Manufacturing Company, and the balance in the Plant.

One twelve-station Wotton charging panel connecting to a Wotton motor-generator set.

One Triumph motor-generator set.

Twelve charging stations in the garage, equipped with stands for receiving batteries from the tractors, and complete outfits for testing conditions.

One ten-ton Shaw crane and three twenty-inch magnets for handling steel in storage.

The principal features to which the system owes its success may be briefly listed as follows:

A tractor garage is adequately fitted up with equipment for proper charging, and facilities for rigid inspection and maintenance.

A special coupler is fastened to the tractor, and so designed that the operator can couple up or let go without any assistance, and most important can push a load at full speed as well as pull it.

The Plant is divided into definite zones and each operator is responsible for the movement of material only in that one to which he is assigned.

No attempt is made to handle more than one load at a time.

Doors in passage ways and between buildings are so arranged that they can be opened by the operator without stopping or getting off his machine, and everything possible is done to keep the holdups to steady travel at a minimum.

Aisleways are kept clear by each operator in his own zone.

No material in process is allowed to be piled anywhere other than on trucks, each operator supplying the requirements of his zone.

A Transportation Superintendent is responsible both for all tractor activities and for the maintenance of the equipment. He is on a par with the Department Foreman and answers to the Plant Superintendent.

The Plant covers ten acres and contains, beside the steel storage, sixteen buildings and three storage yards through which material passes. All active production is carried on on the ground floor with very slight variations in grade.

Concrete floors which originally covered a good share of the floor area have gradually been replaced with wood block. On account of the heavy loads carried and the steel wheels on the trucks it was found that wood block gave by far the best results from both an operating and a maintenance standpoint. When a hole appeared in the concrete it was impossible, without considerable expense to make a permanent repair. With wood blocks it is only necessary to remove one block in a defective area and the rest will come up readily. It is then a matter of minutes to place new blocks that can be run over immediately.

Several schemes were tried out in laying blocks on the old concrete floors. A cushion of sand was spread over the old floor in some sections and the blocks laid on top. This was found to be unsatisfactory where the travel was along one path, as the sand would push out and leave a rut. The most satisfactory permanent floor was obtained by surfacing the old concrete with a float coat, and then tarring it before laying the blocks. This was impossible however, in some sections where travel had to be maintained, and good results were obtained by mixing the sand cushion with some cement and laying it slightly damp. This prevented the sand from moving and set to conform nicely with the bottom of the blocks. Traffic could be resumed over such a section practically at once.

In some of the more crowded departments the aisles and spaces between machines are barely wider than the truck, so that the usual systems in effect could not hope to operate successfully. Here, however, with the ability to push and the widely flexible equipment, only a few inches of clearance are necessary to travel and control the loads at full speed.

Spaces are provided in the different departments where truck loads of material can be stored ahead of operations; with one end of each truck to the wall and all facing out, so no sorting or extra moving is necessary to pick the load desired. Here also spare empties may be banked up if they are not needed at once, and no extra handling is required to place them side by side for greatest economy of space.

The three Baker tractors are of the elevating-truck type *without* the elevating mechanism. They have frames constructed of heavy commercial angle, channel and plate, reenforced and connected with massive steel castings. This frame is amply strong to stand up under the shock of running full into a heavily loaded truck. The motor transmits its power to the two driving wheels through heavy universal knuckles, a feature that is a distinct advance over the old style internal gear and pinion. The two front wheels are mounted on a universal joint that gives in effect a 3-point suspension so that uneven floors will not lift one wheel from contact and throw a strain on the frame. All four wheels steer, as is necessary in order to negotiate the sharp turns, and are controlled by means of a steering lever at the back of the machine. One twelve cell battery is carried over the driving wheels to give the best traction and is slightly ahead of their centers, to preserve a solid balance. It is so mounted that it can be slid off sideways. Slip connections complete the circuit to the motor, to admit of quick replacement. The control is governed by a kickout device connected to the foot brake, so that when the brake is set the power is shut off, even though the controller is not in the off position. Further, the machine cannot be again started until the controller is moved to neutral, setting the kickout. With this arrangement a quick stop can be made under all conditions, as is often necessary when working in close quarters at full speed.

The tractor and its battery weigh 2300 pounds on the rear wheels and when fully charged will start and move a ten-ton load over the more or less uneven floors. It has a speed running free of about eight miles per hour and will handle a two-ton load at four to five miles per hour. These three tractors have seen a year of continuous service in the Plant and so far have entailed no expense for replacements or repair. The machine can and frequently is brought from full ahead to full reverse without waiting to come to a stop before the control is operated.

The one Baker heavy duty tractor is hardly worth mentioning here as it bears all the features mentioned above and is standard in every respect. Due to its size and weight it is not suitable for the regular production work as it cannot be handled readily enough and is not sufficiently flexible to keep up the pace required of the lighter machines. When fitted with the coupler it cannot get close enough to a truck to take hold and maneuver in the narrow aisles and sharp turns in certain parts of the Plant. This fact incidentally shows the difference between the system in force in the Hydraulic and in other places where the heavy tractor is standard equipment. This machine, then, is kept for work requiring an unusual amount of traction, and is as a result idle a good part of the time.

The seven Ellwell Parker tractors are all of the same design as the first one purchased and have pressed-steel frames similar to one-half of the old style baggage carrying truck. It was necessary to re-enforce them at certain points so they

(*Continued on Page 36*)

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The Most Interesting

MANUFACTURING today must be done on a sound and economical basis. If manufacturers cannot produce goods at a cost which will permit selling at a price which you and I can afford to pay—they cannot meet competition. People today are comparing prices. They will not pay a price which is high merely because the methods used in manufacturing are expensive. The cost of manufacturing has been too high. There has been altogether too much waste in industry. This waste must be eliminated. The volume of production must be increased. Then prices will come down and stay down.

Why has Henry Ford been able to reduce the price of Ford cars so radically? The reason is that he increased production by every known method and consequently reduced the cost of manufacturing each car which the Ford plant turned out. Sound production methods—methods which reduced overhead expense, which eliminated waste—which introduced economies of operation, these made an increased output possible.

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Here is a big, new profession which presents more interesting possibilities and more prospects of immediate and substantial reward than any other profession which is open to men like yourself today.

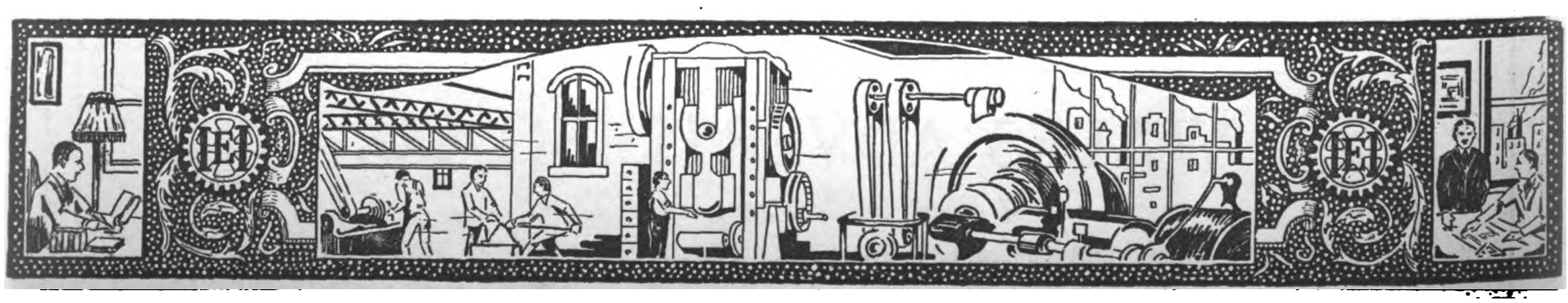
It doesn't make any difference what sort of work you have been doing; if you want to take a real man's part in American business; if you want to get the keen enjoyment which goes with the production of finished goods from raw materials; if you want to do work which is so interesting that it never becomes monotonous—start now.

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Work in the World

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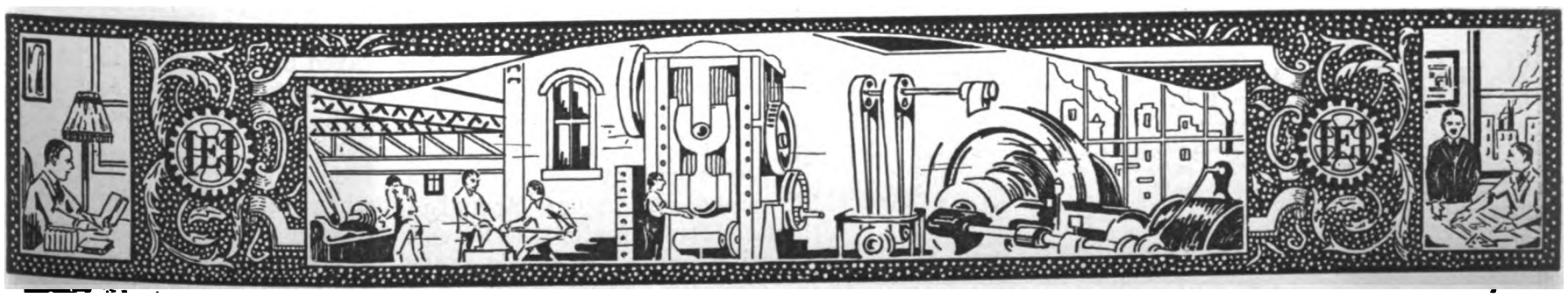
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ENGINEER

35 W. 39th Street New York, N. Y.

(*Continued from Page 32*)

could withstand the severe conditions met in service. They carry two sets of batteries connected in parallel. While the one battery on the Baker will drive it for eight to ten hours the two on this machine are sufficient to last sixteen to twenty. This point, while unnecessary now, was of considerable advantage when there were not enough units in the equipment to allow certain ones to be on charge while the others were running. The motor furnishes power to the driving wheels through an internal gear and pinion, an arrangement that is being replaced by the universal knuckle in modern makes. Its speeds light and loaded are about the same as the Bakers. It weighs less with the two batteries than the Baker, coming to approximately 1900 pounds on its rear wheels. It can handle a maximum load of about eight tons.

Notwithstanding the old design and weaker construction of these machines they have an enviable record of service. On the average they have all seen five years and the oldest has run steadily for seven and is still going. A very conservative estimate of the latter's travel is 68,000 miles, and it has done better than 50,000 ton-miles of useful work.

The batteries, with the exception of two trays of Edison, are Exides of standard twelve-cell construction. They are all fitted with terminals to make slip connections on the tractors. They show an average life of better then three years and the oldest is over four. The battery in itself is of very rugged construction and is able to stand up under severe service conditions. Proper attention and careful charging and maintenance result in long life. Considering the fact that one tray (lasting three years) will move over thirty thousand ton-miles of material in process, the doubts of some manufacturers as to the advisability of this style of motive power for factory transportation are effectually answered.

The trucks are of ten-ton maximum capacity and weigh approximately a thousand pounds each. They are all of the large center-wheel type. with four castor-wheels at the ends set somewhat higher, so the truck can be swung on its own centers and the casters serve as a balance limit only. The first trucks, and in fact most of those now in service, were built by the Lakewood Engineering Company. A hundred were purchased from the Atlas Manufacturing Company and lately the company has built their own, as herein described.

The body is of 5 x 1½ x ¼ inch pressed steel channel, riveted together with ½ inch rivets. The top is a ¼ inch steel plate 2'10 inches wide x 8'-2 inches long. The stake pockets and corner reenforcements are of ¼ inch plate, partly riveted and partly welded on. The wheels and all castings are of steel. The main bearings are Hyatt and the castors run on pin rollers. The stakes are commercial 2 inch x ¼ inch angle with a rivet driven in the flange a few inches from each end to limit them in the stake pockets. Slotted channels are riveted or welded to the sides of the truck in pairs near the ends to hold a pair of stakes set across the truck and about six inches above the bed, to elevate loads that are longer than the truck, for handling purposes. These cross stakes are removed and used in the end pockets for shorter loads and the supporting channels do not interfere.

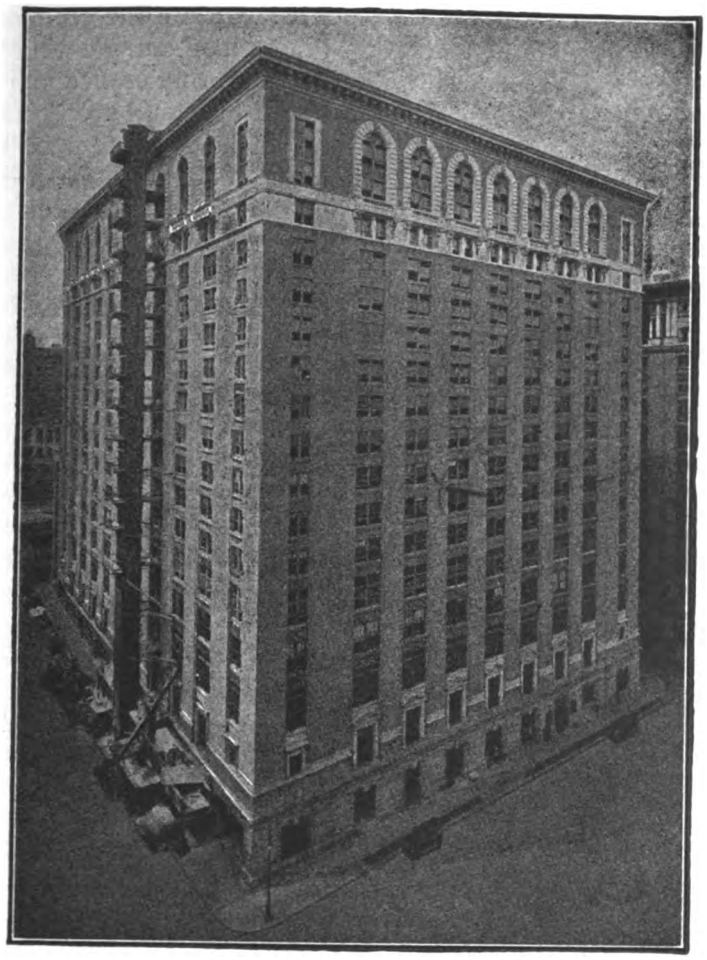
Pipe stakes were originally used, set in the truck through holes in the top and resting in pockets riveted to the bottom of the channel. It was found, however, that they were not strong enough and that the pockets would become bent and allow them to fall through. They are now being replaced by the outside packets and angle stakes, incidentally increasing the truck capacity by several inches.

Although it is seldom necessary, the Hyatt bearings in the main wheels make it easy to move an empty truck by hand.

The whole assembly is designed to withstand most severe use in service, as experience has shown that a little saved in material on the average factory truck is soon lost in its inability to stand up under everyday hard service. Indeed it has been the custom when an extra heavily-loaded truck is stalled for any reason, to back away from it and then hit it head-on to get it into mo-

(*Continued on Page 38*)

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GC-35

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(Continued from Page 36)

tion, as production requirements in the past have not been able to wait for gentler methods.

On a few of the trucks a superstructure is built to handle the stock steel sheets from storage to the shearing and blanking department. These sheets run 48 inches wide x 180 inches long. The structure is set at the height of the shear and blanking press beds so the stock can be slid directly from the truck through the operation. These trucks are used only in the department for which they are intended and are not removed for repair.

Many different styles of special bodies above the truck have been tried but always the Company has reverted to the one standard as just described, as specializing design tends toward confusion and much lost time getting the special truck when wanted.

One of the points that caused lost time in handling loads at full speed was the 8 x 8 foot sliding doors between buildings. It was necessary for the operator moving a load to stop before a closed door, get off his machine, walk forward and slide the door open, then walk back and drive through, stopping on the other side to get off and close it again, before proceeding. In the winter months with snow on the ground, stopping a load outside would often mean getting stalled and so the operator would keep going and leave the passage open behind him. This resulted in a great deal of lost time on the part of the men inside. Accordingly a man was stationed through the cold months at each door to open and close it as required.

Finally double-acting air hoists were purchased and installed at each door and control chains run from the operating valve through conduits to handles on each side of the aisle and on both sides of the door at a distance from it of somewhat more than the length of a tractor and truck. The Tractor operator could then pull the control to open as he passed, and without stopping go through; to close it again as he passed the handle on the outside. This effectively stopped the troubles attendant on having to operate by hand and the lost time on the part of the men when the door was left open. The saving effected through releasing the man that had been stationed there paid for the installation in less than two months.

The coupler was designed by Mr. Culhane to obviate several drawbacks to economical operation that he found resulted from the use of the standard pin and socket in general use today. It consists essentially in a simple and rugged mechanism that will take hold of the truck by running into it. The coupler assembly is rigid right and left with reference to the tractor but has a variation up and down. It is supported on the low limit to the proper height to engage the center of the pin on the truck. When therefore the operator has taken hold of the truck he has as complete control of it as though he were pushing it by hand. He has the added advantage of all the power in his tractor to steer and push or pull as he desires. When he is pushing a load ahead of him and he wishes to make a turn to the right he starts his tractor toward the left. This swings him out of line with the truck, taking the nearest end of the truck out with him, while the truck pivots on its center

(Continued on Page 40)

CORRUGATED WIRE GLASS

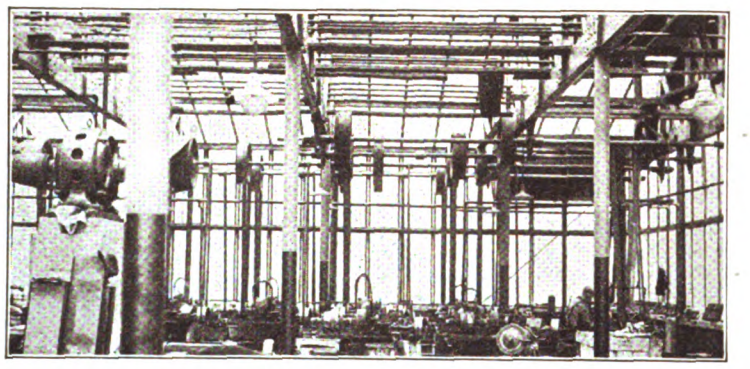
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Designed to meet the needs of every time and motion study problem arising in our industrial organizations.

The "take out time" feature which has long been considered **the most important** one in connection with timing instruments, has been developed by us for use in connection with split hand watches. This having been made possible by our close association with hundreds of manufacturing plants making time and motion studies and a consequent recognition of what would best meet their needs most generally.

The DECIMAL SPLIT HAND COMPUTED TIME STUDY WATCH with the "take out time" feature is the peer of all split hand instruments. The older types of split hand watches are of the crown control type, allowing only the starting, stopping and throwing back to zero of the large hands. The "take out time" feature on the improved instrument allows the observer to start and stop and advance from any point, as many times as may be necessary.

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(*Continued from Page 38*)

and its other end swings to the right. He then starts his tractor following to the right to a degree depending on how sharp a turn he desires to make. The further out of line to the left he starts the sharper the turn he will get started. He is able to turn the truck at practically ninety degrees of its own center, and then, following with the tractor, to complete the turn in half the length of the truck. He can make such a turn and push his load into a space only wide enough to clear a few inches on each side. He can move half-a-dozen capacity loads from one point to another and line them side-by-side with ends to the wall, or in any other position he desires, in the time that a train of trucks under any other system would be brought into position to be coupled up; much less than the time necessary to transport such a train to another point, uncouple and place it. And he can do this without any outside help, and at full speed.

It is of considerable advantage to be able to line up a row of trucks waiting for the next operation with their ends against a wall, both for purposes of taking hold again and of sorting. This is an easy job with the right coupler and its attendant ability to push and accurately guide. It is an impossible feat with any other equipment.

The coupler consists in a pair of fingers made in the shape of a half circle at the outer ends to engage the coupler-pin by closing in sidewise. The inside edge of these fingers at the inner end is tapered to form. They are enclosed in a housing that allows a limited side motion around two pivot pins running down through the housing and the centers for the fingers. The housing is mounted on a coupler-bar fastened to the tractor, and is allowed a limited travel lengthwise of the bar. The bar itself terminates in the housing in a tapered point that comes between the tapers on the fingers. This taper is in such a position that when the housing is out to the front limit of its travel the fingers stand apart, and when at the back limit it forces the outer ends of the fingers together to engage the coupler pin. When not engaged, springs hold the housing forward and the fingers open. When pushed against a truck, the housing is forced back, closing a latch and holding the fingers together. A cord runs from the latch pin to a point in reach of the operator; who, by pulling releases the housing and allows the fingers to move apart. The Company had this particular coupler patented and exchanged the rights to sell with the Ellwell Parker Company for a tractor.

To eliminate long hauls and to avoid having two or more tractors covering the same ground needlessly the Plant is divided into zones depending on the production requirements and at the discretion of the Transportation Superintendent. A man with a tractor is assigned to each zone. It is his duty to carry loads to the next zone in line of operation and to place them as directed, and in any position desired by the pressman or foreman in charge. He then hitches to an empty which his load replaces and returns to his own zone. here he places the empty as may be required at one of the machines or in his own place of storage if it is not needed at once. He is answerable for activities in his zone only to the Transportation Superintendent, and if he is travelling through the Plant without either an empty, enroute to his own zone, or without a full load for the next operation, he very soon hears from that gentleman.

With this arrangement only the tractors that are necessary for the day's run are being used and they are always where they are wanted. "Bunching" is practically eliminated. The Department Foreman does not have to worry about trucks and can concentrate on his own business of producing material to move.

The tractor has authority to refuse to move loads that are improperly piled and in return has to reload himself any material he may spill in moving it out of his zone. This tends to keep things orderly and saves a lot of time. He also is responsible for the condition of the aisles in his zone and can offer no excuse for becoming blocked by material in the right of way.

In return for being held re-

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sponsible for the condition of his equipment the Transportation Superintendent is given every opportunity to properly care for it. All necessary tools and testing apparatus is provided for him. There is an attendant constantly on duty in the tractor garage charging, cleaning and repairing the batteries whenever any little defect shows up.

When any tractor has run its allotted time or shows signs of slowing up unduly it is driven in alongside one of the battery stands. The slip connections are pulled out and by means of another tractor the run down or doubtful battery is slid off and a fresh one put in its place. Connections are slipped in and inside of five minutes the machine is ready to go out again.

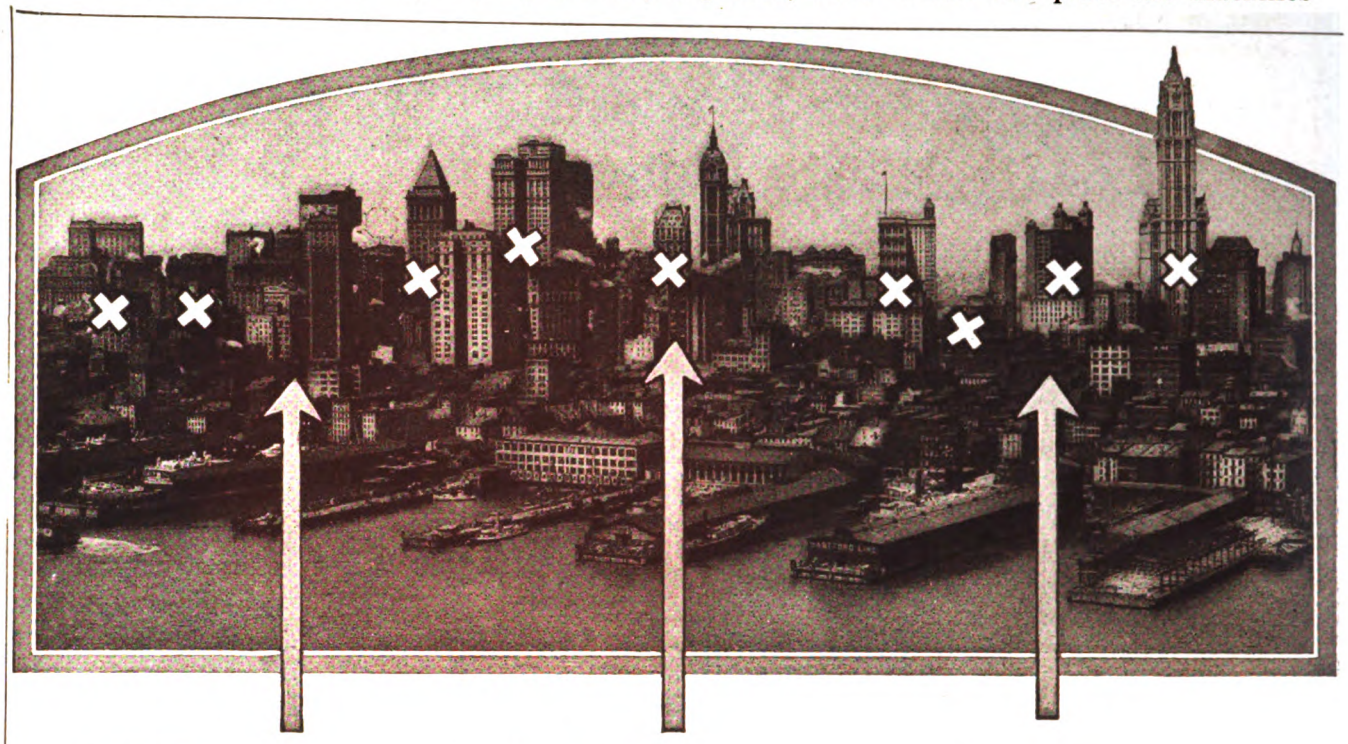
The battery just removed is immediately wiped clean all over, then the caps are removed and the gravity tested. If it shows to be only in need of recharging distilled water is added if necessary and the charge started in accordance with the requirements shown. If something else is the matter steps are immediately taken to correct all the trouble.

None of the trays are allowed to stand discharged and a proper temperature is maintained at all times in the garage. While on charge the temperature in the battery is tested at frequent intervals and the charge run accordingly. In short everything necessary is done with the least delay and is one of the principal reasons for long service obtained.

When eight tractors are running on a shift, two are in the garage. These are each day gone over carefully and any minor adjustments that may be needed are made. When two or more shifts are being run in the Plant these two are put in service on the following shift and two of the others taken out and gone over in the same way. Thus each machine gets a careful inspection at regular short intervals so that none are neglected; the old saying concerning "a stitch in time," applying here in full force. Also, certain parts that are likely to give out for various reasons are kept in stock so that the delay may be brought to a minimum.

Trucks that need repair are hauled to a separate department fitted with the necessary tools and where a stock of replacement parts are kept. If the body is broken or damaged, the wheels and running gear are removed and set on a new stock body, so the wheels may be in servic as soon as possible and the necessary time can be taken to repair or rebuild the body. If only minor repairs are necessary to the running gear the defective parts are removed and replaced with new (or previously repaired) ones and the truck is again ready for duty.

The Transportation Superintendent keeps in daily touch with the Production Control so as to know what is going to be required, and can divide the Plant and place his machines



Here and Here and Here

Wherever big things are done and big incomes earned you find Alexander Hamilton Institute men.

DOWN at the foot of Manhattan Island, in a space hardly larger than a good-sized pasture, Business has concentrated one of the greatest financial centers ever assembled in a similar space before.

Here is a Supreme Court of Business. Nowhere else is competition more keen; nowhere are failures weeded out more remorselessly. For an institution of business training there could be no severer testing ground.

Do Alexander Hamilton Institute men stand up in this area of high competition? What is the verdict of Big Business upon this training—of Big Business which measures incomes in five figures, or even six?

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SUPPOSE you walk through this district, picking out the buildings at random, and ask: "What is the record of Institute men in this building? And in this?"

The great grey building on the left as you walk up Wall Street is the National City Bank, with resources larger than any other bank in the United States.

How many Institute men are here? Two hundred and one.

"Personally, I cannot speak too highly of the Course," says J. H. Carter, Vice-President of the National City Bank.

Across the street, a little farther up, the Bankers Trust Company, with forty-four Institute men. Around the corner, on Broadway, the Empire Building owned by the United States Steel Corporation, with 545 of its men all over the country enrolled.

"I shall consider each man a more important factor"

A LITTLE farther on you pass a Regal Shoe Store.

"While I do not wish to influence our men in their decisions, I do not hesitate to say that I shall consider each man a more important factor in this organization the moment he enrolls for the Course."

H. D. Carter, the General Manager of the Regal Shoe Company, said that; and all through his organization are Institute men.

In every great company there are men enrolled. Many of them are the heads of their organizations; Presidents and Vice-Presidents; most of them are important officials and department heads; a few are men with smaller responsibilities.

At 26 Broadway, the Standard Oil Company, with 801 men throughout the country enrolled; in the lofty Woolworth building, a department of the Pennsylvania Railroad Company, which numbers 228 Institute men among its officers and employes; at 165 Broadway, the Westinghouse Electric and Manufacturing Company, with 412; at 195 Broadway, the American Telegraph and Telephone Company, with 139: in the same building, the Western Union Telegraph Company, with 291.

Only you know how much a year of your life is worth

IT would be literally possible to fill this magazine with the names in the great commercial and financial institutions of the country, and the letters of their executives in praise of the Alexander Hamilton Institute's training.

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"FORGING Ahead in Business" is a 120-page book which represents the results of eleven years' experience in training men for success. It is as live and current as the financial page of this morning's newspaper.

One evening spent with it will answer all your questions about the Modern Business Course and Service. It is sent without obligation; send for your copy today.

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How Can I—

Compute Time Studies-Set Piece Work Rates-Find Accurate Costs-Locate Waste Motion?

Time Study men, production managers, superintendents, foremen—now you can know how to compute time studies of any job, set piece work rates, locate cost leaks. The experience of trained time study engineers, gained through years of research is at your service in a direct usable form—specifically applied to your work.

It may be an operation in the soap industry, the building of a railway locomotive, a job in the ordinary machine shop or in the textile mill—our courses in "Time and Motive Study" give you definite formulas, complete and detailed directions. These courses have been resolved into their simplest forms—there are no intricate charts, no higher mathematics involved. Take them right into your shop, use them with your time study watch, and do all the work yourself. No outside expert assistance needed.

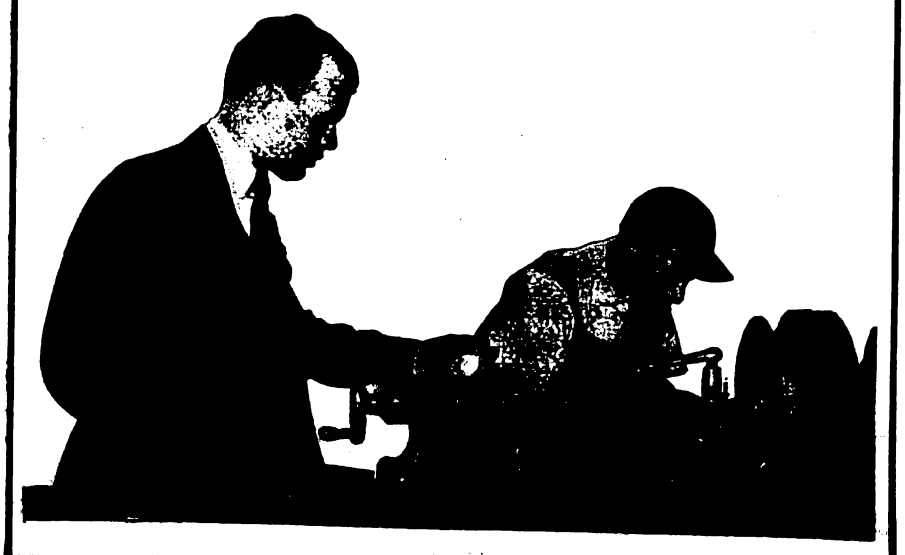
A Big Demand for Trained Time Study Men

Never before has the man trained in the factory been able to apply time studies to his particular work without an immense amount of labor and experiment. Yet the demand for trained time study men is growing every day. Write us for all the details of the "Time and Motion Study" courses. Tell us the type of work you are doing, the product you make, your position with the company. Each letter receives our personal attention.

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THE TAYLOR INSTITUTE

122 South Michigan Ave. Chicago, Ill.



to the best advantage. Each night he assigns zones for the next day and places his requistion for new men as they become necessary.

When a new man is hired he is not expected to get at once onto a tractor and operate it successfully. In fact, the idea of pushing and controlling a load is so out of line to the average tractor operator applying for a job that he does not know how to start. New men are therefore taken out on the tractor of one of the old experts and ridden about the shop while the experienced operator performs his duties through a morning. This gives the novice a fair idea of the fundamentals of what is being done and how to go about it. He is then given a tractor and an empty truck and instructed to practice in the yards, out of the direct flow of traffic. After a short time the average applicant will then have mastered the game sufficiently to be put inside in one of the less busy departments where he can acquire speed. It is an interesting fact that, once accustomed to this way of operating, the men prefer it to others and would rather push a load than pull it.

After the superintendent has placed his men he spends sufficient time in the garage and repair department to supervise the work being carried on there. He then goes out in the shop, on the watch to see that loads are properly piled and that the fair average load is not exceeded or run under. He watches the flow of production and foresees traffic jams that are bound to occur without constant guarding. He controls the movement of empties, keeping them distributed to the best advantage or bunching them to take care of a spurt in any department on which he is forewarned through the production control. He watches the movements and actions of his tractors and in short he endeavors to obtain that for which he is responsible: the utmost useful employment of the ton-mileage represented by his equipment and its daily condition, in order that it may continue to serve to the limit.

How well he is accomplishing his work is shown by the performance of the tractors based on data from the three Bakers. They show an average each of over eight hundred useful ton-miles per month, at an operating cost of about twenty-five cents per ton-mile.

In order to make the story of the movement and handling of materials from the incoming car to the point of shipment complete it is necessary to here describe the construction and operation of the Shaw Electric Travelling Crane. The crane is of ten-ton capacity and bridges three railroad tracks, the scrap bins and the steel storage yard. It is fitted with a special two-drum carriage from which is suspended the beam that carries the three magnets and the rotating mechanism. With this arrangement the magnet beam support is held from swinging out of a position directly in line with the carriage. The magnet beam is pivoted in its support and is geared to it through a motor mounted on the support. With the control for this motor mounted in the operator's cab, he can rotate the magnet essembly at will and place it in any desired line over a load to be picked up. He can then make a lift and rotate to any new position.

One man in the crane cab can handle all the incoming steel from cars to pile and from pile to trucks for production, and in addition can load the scrap to outgoing cars as fast as it accumulates. The magnets will lift sixteen 48-inch x 180-inch x 3/16-inch sheets at one time. When cars come in with their loads shifted, the operator places his magnets to the best advantage, lifts what he can and by swinging gently against the side and end of the car can straighten the load quite readily and pile it in an orderly manner.

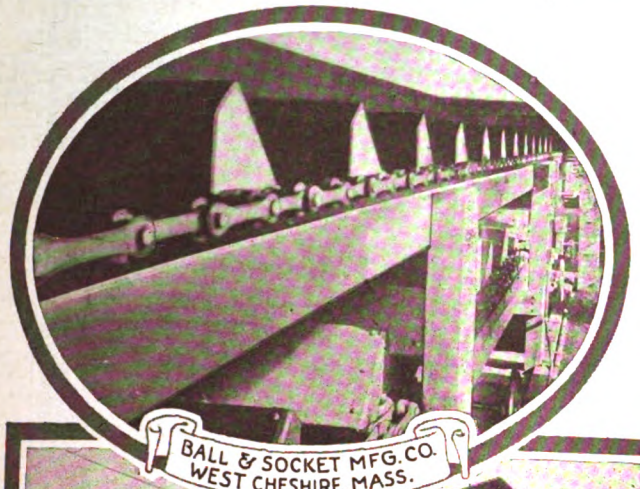
The crane operator is provided with a telephone on the Plant automatic 'phone system, through which he receives orders scheduling delivery to the factory trucks and naming locations in the yard for incoming material. With these named facilities the one man on a shift can unload all incoming material, and place it in the yard. He can load all scrap for shipment and can furnish without any other assistance all stock necessary for production.

When he is notified to start deliveries to the Plant the

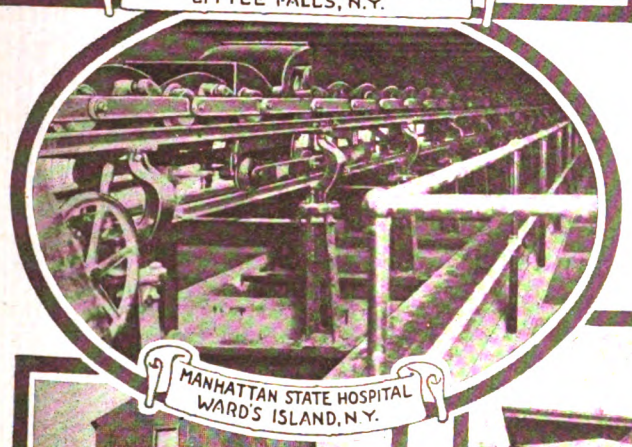
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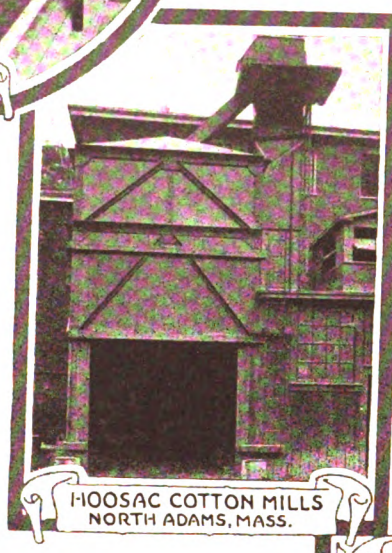
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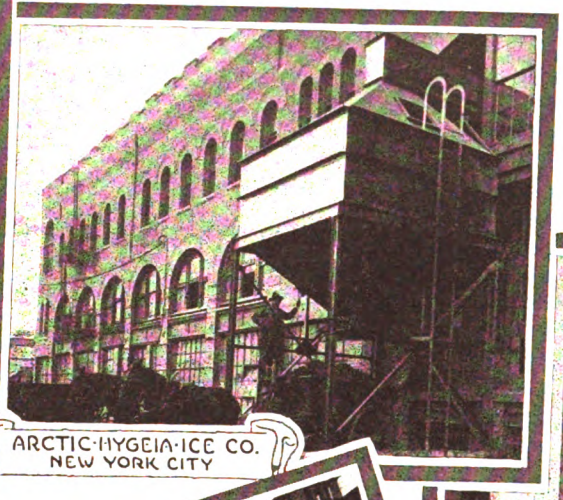
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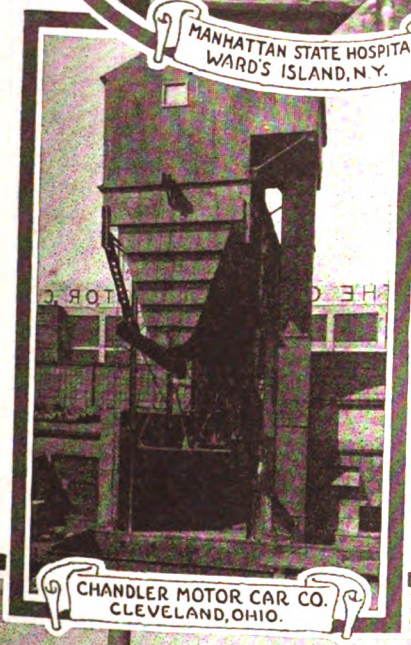
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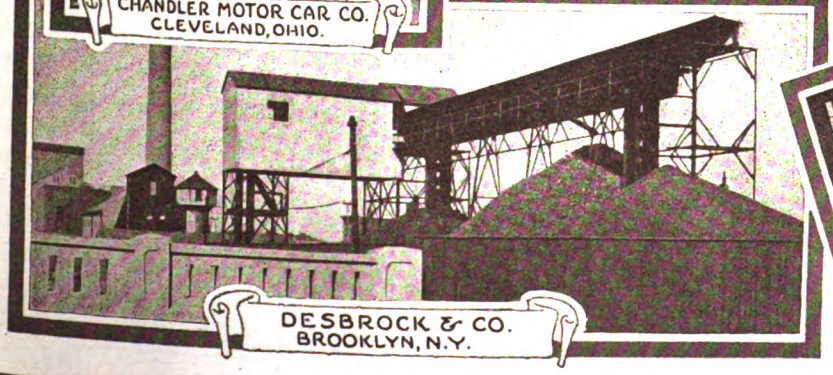
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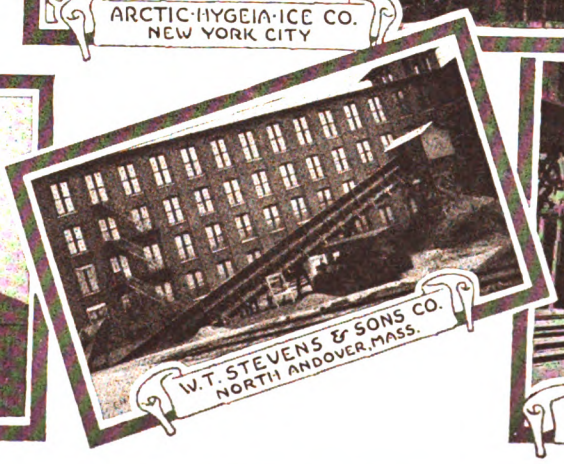
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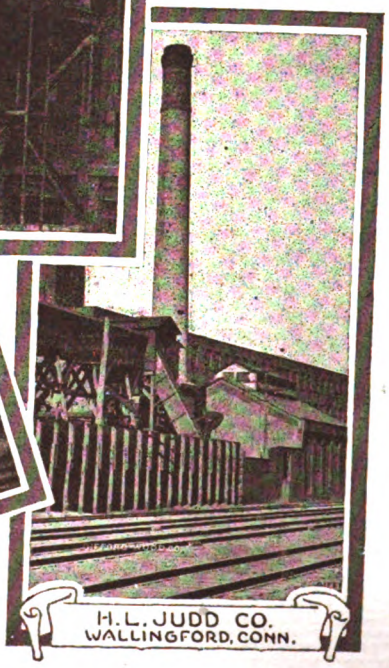

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K

"—The cost of production is still too high here—"

—REGINALD McKENNA,
Former Chancellor of the British Exchequer.

What are you doing in your plant to reduce it?

How is it going to be reduced? By whom? When?

In the report just published by the Committee on Elimination of Waste in Industry, appointed by Herbert Hoover, of which Mr. Knoeppel was a member, lies the answers to the questions asked, in the following condensed and paraphrased statement of recommendations under the heading—"Responsibility of Management"—

1—Managerial Control, reaching material, design, equipment, personnel, production, costs and sales policies and coordinating these factors to a common objective.

2—Conscious production control to reduce or eliminate waste by shortening the total time of production.

3—Production capacity based on study of normal demand.

4—Coordination of purchasing activities.

5—Production schedules based on study of markets, thus stabilizing production.

6—Adequate inspection.

7—Maintaining plant and equipment in working condition.

8—Establishing uniform cost accounting.

9—Methods of wage payments ensuring a proper relationship between effort put forth and result achieved.

10—Standardization of products, materials and equipment.

11—Development of performance standards as an aid in planning and production control.

12—Proper selection, up-grading and maintaining personnel.

13—Prevention of industrial accidents.

14—Carrying on industrial research.

Reduce your costs of production, increase your working capital, improve your financial position, bring about a liquidation in values, secure a great economy in manufacture, by starting a campaign to ELIMINATE WASTE in *your* plant.

Since August, 1920, we have been at work on a *Scientific Industrial Survey Procedure,* which we know to be as great a development in our field, as was our Blue Book No. 3 on "What Industrial Engineering Includes."

We are, therefore, prepared to make a scientific analysis of factors in your business contributing to waste and to prepare a report which *will serve as a real basis for your future developments.*

Waste material can be put on a pile and salvaged later.

Wastes in time and in money are lost forever.

Make your decision *today* to have us make a real survey of your wastes, as the basis of their elimination

Knoeppel
Organized Service

We can describe our plan briefly

C. E. KNOEPPEL & CO., Inc.
Industrial Engineers

52 VANDERBILT AVENUE NEW YORK

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(*Continued from Page 42*)

Transportation Superintendent is also told what to expect. The latter places his trucks under the runway, production starts, and the system is complete.

The problem in successful and economical handling of material in process through a plant is rarely one of sufficiently strong equipment, for that can be obtained for a price, but rather is one of the greatest possible use of the ton-mileage represented in that equipment. This entails two points: first, the careful maintenance of the equipment so that its potential life can be completely realized; and second; the best possible use in daily service. This latter means the least amount of unloaded running; the least attendant expense for taking hold and letting go; the exact placing of loads at full speed; together with the greatest possible elimination of handling a load once placed on a truck, other than to run it from that truck directly through an operation to another truck or into the freight car. The tractor to be used should be that which is heavy enough to stand up, and yet light enough in handling. Ability to maneuver, accurate placing, and a minimum of light running, can almost always be obtained by the use of such a tractor, with one truck loaded to the fair capacity of the tractor. A Plant which can only pull its loads, or one that works on the train plan and employs heavy tractors, cannot hope to compete in cost or in total material moved with a Plant operated and equipped along the lines described herein.

Control Through the Cost System

(*Continued from Page 17*)

to light. Give them complete access to every cost figure involving their departments. You must have their full support or your cost system will become a "costly" system.

Use graphs, if possible, to visually express results in carefully planned shop conferences with superintendents first, then with a superintendent and the foreman under his direction. Encourage free expressions of opinions.

You can "play" similar departments against each other if the spirit of rivalry is properly developed.

Use your cost system as a steel tape to accurately measure results.

Match current costs against the costs of prior periods. Compare actual results with estimated standards. Cost figures must be comparable to be of service. Look for wastes. Discuss frankly all variations. Be fair. If you have the right cost practice you can face the situation with intelligence.

Analyze your overheads. See that a careful distinction is made between factory departmental, general works, administrative, and sales overheads.

Consider the advisability of altering, temporarily, the overhead rates in use, due to prevailing industrial conditions. Low production should not carry all the overhead load in these abnormal times.

Budget your business. Analyses are an invaluable aid.

Do not feel that you can operate a production system and a cost system independently. They must be tied together.



A PHOTOSTAT Would Have Prevented Such a Mistake

REG. U. S. PAT. OFF.

"LAYING the blame on the drafting room doesn't help us. Theoretically they should have noticed those transposed figures when they checked the tracing, but the fact remains that the error crept in in spite of the checking.

"And what is the result? It will cost us our entire profit on the job to correct the faults of that mistake. And we could have bought several PHOTOSTATS with what we will lose.

"That mistake *couldn't* have occurred if we had made PHOTOSTAT copies of the blueprint instead of tracing it. The PHOTOSTAT makes photographic facsimiles so you don't even have to check them.

"And compare the time it takes to make PHOTOSTAT copies against the time it took our drafting room to trace that blueprint and to make additional blue prints. Why, it's a matter of minutes against hours. By copying blueprints, pencil sketches, drawings and orders with the PHOTOSTAT we can get all our work into the shop days earlier than we do now.

"I tell you, no matter from what angle you look at it, everything is in favor of the PHOTOSTAT.

"And we have any quantity of other kinds of work for the PHOTOSTAT. It will relieve our stenographers of a lot of copying—do it in far less time and with absolute accuracy. We can copy catalog pages, work sheets, contracts, production charts, letters, specifications, legal documents, and advertising layouts. The machine will more than pay for itself inside of six months."

Our booklet, "A Good Word for the PHOTOSTAT," contains letters from users of the PHOTOSTAT all over the country and in many different industries, telling of large savings the machine has made for them. Send for it.

PHOTOSTAT CORPORATION
299 State Street ROCHESTER, N. Y.

88 Broad Street, Boston
7 Dey Street, New York City
429 Monadnock Bldg., San Francisco
19 South La Salle, Street, Chicago
510 North American Bldg., Philadelphia
601 McLachlen Bldg., Washington

Executive Office: Providence, R. I.

AGENCIES:
Alfred Herbert, Limited: Coventry, England; Paris; Milan; Brussels; Amsterdam; Calcutta; Yokohama; Sydney
Graham Brothers: Stockholm

PHOTOSTAT

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Saves Money—Saves Steam—Saves Time

The Steam Trap Sarco saves money because it costs but *one-third as much* as cumbersome float or bucket traps.

It saves steam because it positively *does not leak.*

And it saves time, because it is so easy to install and operate. No supports, building up, pit digging or floor space required. Simply put it at any angle, anywhere on the line. It has no complicated system of floats, valves or other parts to get out of order and require constant adjustment.

The Steam Trap Sarco is a simple, compact Steam Trap that does its work efficiently and *promptly.* It releases condensate *as soon as it gathers.* Lines are kept drained of *all* condensate *all* the time. It requires no storage space. It works on the simple, unfailing thermal principle of expansion and contraction. It has but one moving part and that is practically free from wear.

Made in sizes from 3/8" to 3", for any given pressure up to 200 lbs. Write today for a Sarco on 30 days' free trial and interesting booklet R-4.

Sarco Co., Inc.
233 Broadway
New York

Buffalo Chicago
Cleveland Detroit
Philadelphia



The Camera as a Business Speeder

(*Continued from Page 13*)

hand. He can show more samples than trunks could ever carry, with a fidelity to detail and design over which the originals have little or no advantage. Other salesmen carry photographs of plants, to show customers under what conditions their product is made.

Representatives of many concerns, too, carry a Kodak with them and whenever they see anything in the way of a window display, shop interior or an interesting installation of any kind, they snap it.

Manufacturers of machinery which has to be shipped "knocked down," send photographs to illustrate the various steps to take in "setting up." The photograph, in this case, saves the expense of sending a man along to supervise the assembling. Broken parts, too, are frequently ordered by photograph.

Contractors use photographs to watch and record progress work—a photograph taken at regular intervals furnishing its own comment on actual work done.

Railroad companies use photographs for reports on accidents and frequently repair parts are rushed forward from the photograph.

Photography is used by factory managers for furthering safety work. Safety devices are shown, also the right or wrong way of performing operations, by photographs, which can be either placed on bulletin boards or used in lectures for instructional purposes. The observance of safety rules is also frequently checked by means of a Kodak in the hands of the factory inspector. Photography is also used in Shipping Rooms to illustrate methods of packing and shipping.

Many concerns use photographic reproductions of maps, charts, etc., because of their accuracy and their comparative inexpensiveness. Hotels keep photographs of various table arrangements to show patrons planning banquets. Telephone, electric light and gas companies are using photography for meter reading instead of the ancient device of copying the reading by hand, with all its liability to error. Engineers keep photographic records of tunnel construction, bridge work, bridge approaches and of all completed work to show prospects. In fact, the commercial uses of photography are limitless.

The legal uses are just as various: photographs of documents, letters, checks; photographic copies of signatures for indentification; photographs of contracts or valuable papers—too valuable to be taken away from safety vaults; photographs of finger prints, scenes of crime too remote to visit; all find their way to court as "Exhibits A-Z" and are legal evidence in trials of all kinds.

Micro-photography furthers an intelligent study of materials. Its use in studying metal structure is only one of its many practical applications to modern manufacture.

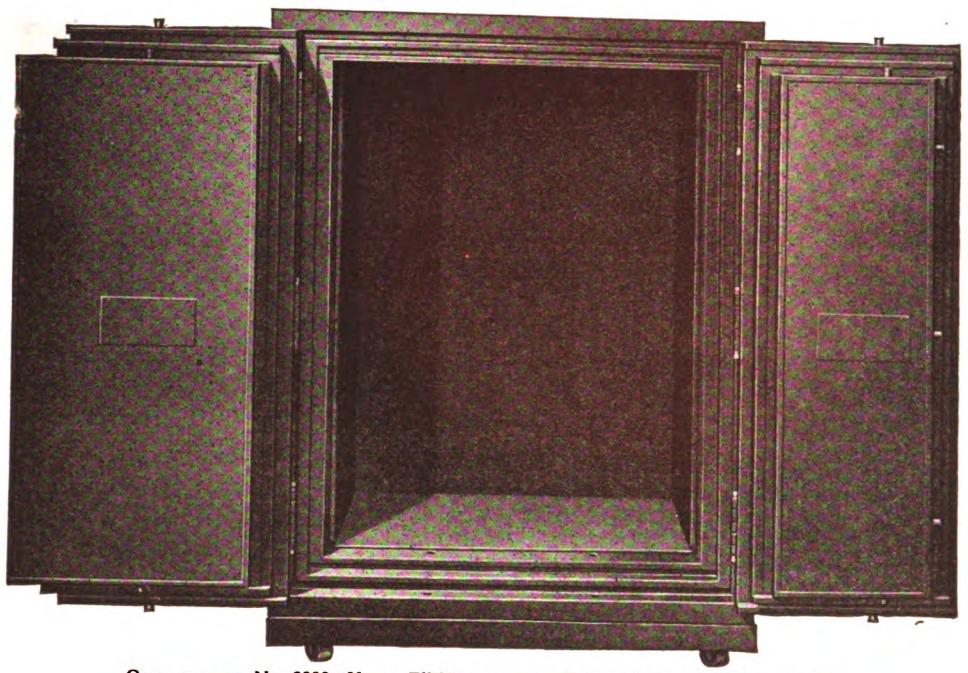
Aerial photography, developed by the war to a high degree of perfection is proving invaluable in peace, as shown on page 13. For the real estate operator, it offers a means of showing exactly, without possibility of skepticism, the "lay of the land" surrounding a prospective client's house. For the factory executive it offers a newer and better way to compare various sites for a proposed new branch; and an aerial view of the existing plant enables him to arrange departments with a view to future expansion and to best make use of shipping facilities.

Motion pictures are becoming more and more an ally of business, for educational and instruction work. What their future may yet be we have hardly begun to realize.

Truly the years have wrought many changes. From the exclusive possession of the studio professionals, or of a few devotees whose enthusiasm and technical equipment were equal to its difficulties, photography has become the possession of every man, woman and child on earth. We wonder if the men who contributed to this result foresaw the limitless field that awaited their discoveries. We wonder if the world at large fully grasps the benefaction their achievements have conferred on mankind. One has to imagine a world without photography to fully grasp all this.

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At Last!
A Dry Insulated Safe!



OPEN VIEW OF No. 2000 "Y AND E" UNDERWRITERS' CLASS "B" SAFE. INTERIOR IS ARRANGED TO TAKE STANDARD HORIZONTAL SECTIONS

THERE have been fire-resisting safes—of varying degrees of efficiency—in the past But they all depended on moist insulation. And moist insulation inevitably causes deterioration with the passage of time: because moisture evaporates, and causes rust and consequent weakening of the walls.

"Y and E" succeeded, in February of this year, in winning the Class B label of the National Board of Fire Underwriters with a *dry insulated* safe which insures

PERMANENT PROTECTION
FOR
Permanent Records

To win this Class B Label, the "Y and E" Dry Insulated Safe had to pass gruelling tests that no safe in actual use would be likely to encounter. Placed in a special furnace for two hours at a temperature of 1,800° Fahrenheit—dropped (while red hot) a distance of thirty feet onto a pile of broken stone and debris—returned, bottom-up to the furnace for another hour—yet, the doors did not buckle, and the contents were unharmed.

Write us today for our new safe booklet, "Permanent Protection for Permanent Records"

YAWMAN AND ERBE MFG. CO.

Filing System Service, Equipment and Supplies

Rochester, N. Y.

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A Builder of Industrial Team Work

(*Continued from Page 7*)

tion among industrial executives must rest upon these corner-posts:

CONSIDERATION — of the other man's viewpoint.

CONFIDENCE —Willingness of men to accept and believe in one another.

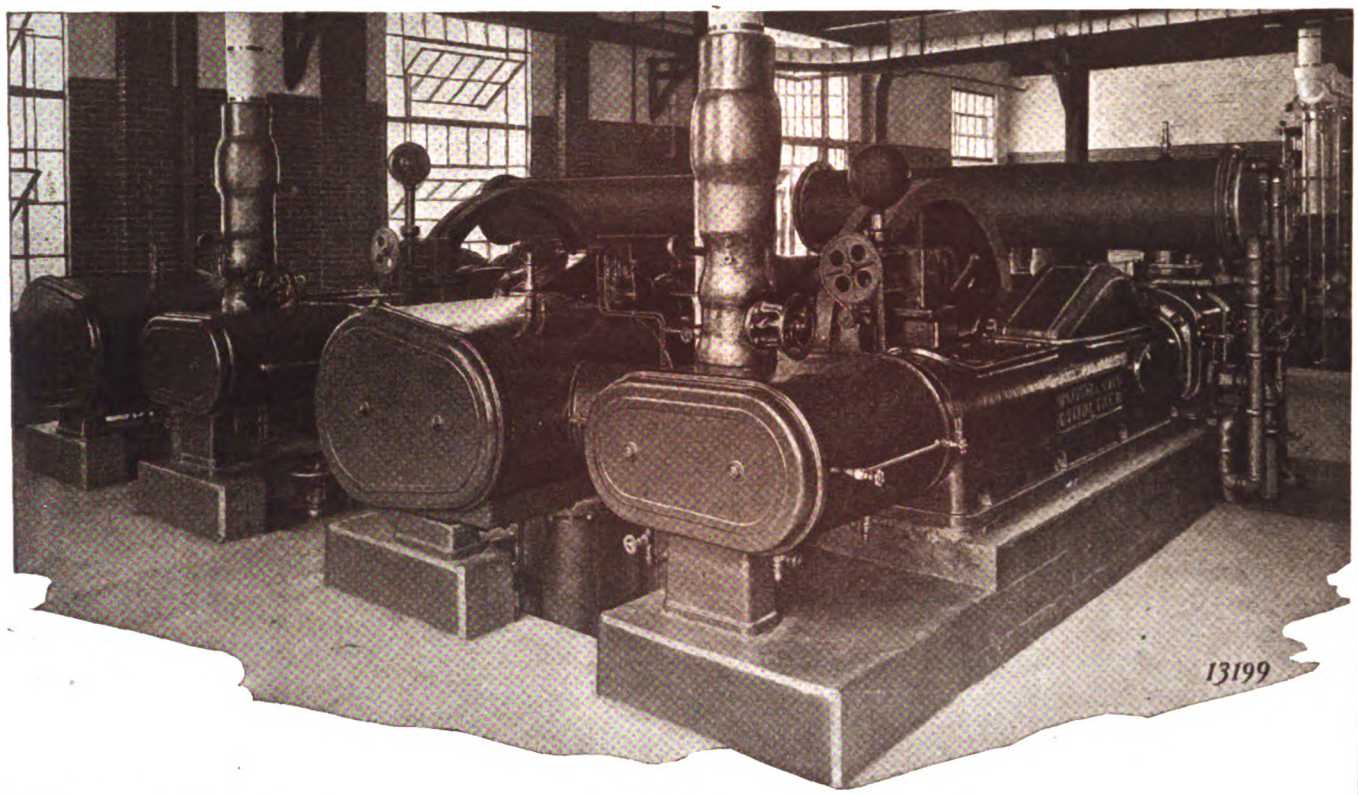
COOPERATION — subordination of personal interest or prejudice for the common interest, and, finally

SERVICE—the practical application of the preceding.

On such a basis has Mr. Hubbard endeavored to direct into constructive channels the forces created by the association together of Connecticut manufacturers, to maintain conditions most favorable to the development and welfare of the State's industries and to work out some of the problems common to Connecticut industries. While some progress has been made, it is Mr. Hubbard's belief that the Connecticut association, and other like bodies, have accomplished only a fraction of what might be achieved if all manufacturers were to accept whole-heartedly the principles of mutual endeavor for their common good. A lack of confidence, and reluctance to credit one another with full sincerity of purpose, are, in Mr. Hubbard's opinion, not only the great stumbling-blocks in the way of manufacturers' relations with one another, but also between them and their employes.

Next to united industry in his State, Mr. Hubbard believes in closer relations between the economic groups of all New England. Accordingly, the Manufacturers' Association of Connecticut is cooperating in movements intended to bring the New England States closer together for mutual consideration of problems common to that section. Mr. Hubbard recently sat as chairman of the Connecticut group in a joint railroad commission appointed by the six New England governors, and is also associated with representatives of other New England States on consideration of other matters of concern to that section.

Three national industrial organizations have Mr. Hubbard on their governing bodies —the National Industrial Conference Board, the National Industrial Council, and the National Conference of State Manufacturers' Associations. Each of these is an "organization of organizations" and they represent in their combined aggregate membership, practically every manufacturer in the United States. If one keeps in mind the fact that these organizations are constantly considering matters of vital importance to the State and nation, that they are each day shaping the thought and action of thousands on such matters as labor policy, railroad control, the tariff, taxation, education, that they wield a tremendous influence not only in Washington but in each State capital, it will be the more readily appreciated how great are the responsibilities and powers of their leaders.



The Efficiency of "XPV" Compressors Is Proven by Your Coal Bills

"XPV" air compressors operate with high steam pressures and superheat as well as with ordinary saturated steam conditions.

The balanced telescopic piston steam valve will not warp with high temperature and is easily lubricated. Steam is admitted through the interior of the valve passing in at the center and through ports near the ends. Exhaust is by the ends of the valve reducing the pressure on the valve stem packing.

The Governor automatically varies the position of the high pressure cutoff and proportions the speed of the compressor to the demand for air.

These and other features of design and construction are responsible for the marked steam economy of "XPV" compressors. Their steam consumption is equal to that of a full Corliss compressor of the same size and more than one-third less than that of a unit equipped with flat steam valves and throttling governor.

Operating engineers approve of their enclosed construction, automatic lubrication and freedom from vibration.

"XPV-1"—Duplex steam and Duplex air cylinders.
"XPV-2"—Duplex steam and Compound air cylinders.
"XPV-3"—Compound steam and Compound air cylinders.
"XPV-4"—Compound steam and Duplex air cylinders.

Capacities at 100 lb. air discharge pressure from 608 to 4145 cubic feet per minute. "XPV" compressors are also built for lower air pressures. Bulletin 3133.

PRICE OIL ENGINES

INGERSOLL-RAND COMPANY
11 Broadway, New York

539-C

Ingersoll-Rand

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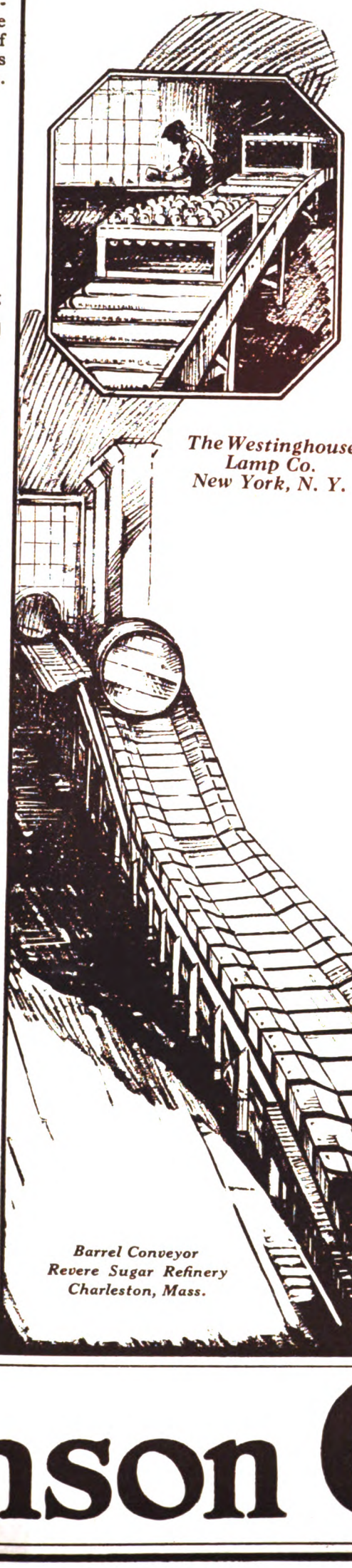
What is the weight of *your* product?

A fraction of an ounce? A ton? Do you make articles as frail as the electric bulbs made by Westinghouse? Do your workmen have to lift, carry or move barrels or more bulky objects?

It doesn't make much difference. Where there is production of any kind—raw materials, goods in process and finished articles to be moved—a Lamson system of mechanical conveyance should at least be considered.

Frequently a Lamson system will increase production with fewer men and less space. Often we can show reduced production costs that make additional profits far above the yearly investment and interest in the Lamson System.

Whether you are running full time or not, whether your factory is crowded or not, *this is the time* to let Lamson engineers study your business and tell you if you should install a Lamson System. We will gladly send you literature. We would rather send you a man.



The Westinghouse Lamp Co. New York, N. Y.



Barrel Conveyor Revere Sugar Refinery Charleston, Mass.

Is your business here?

Lamson Systems are being used successfully in the following industries. If yours is not here, perhaps it should be. Write to us.

Ammunition
Automotive Industries

Bakers Banks
Book Binders
Book Manufacturers
Bottlers
Box and Barrel Shops
Brick and Tile

Candy Manufacturers
Canners Chemicals
Chocolate Refiners
Cigar Manufacturers Clothing
Coffee Roasters
Cold Storage Contractors
Cotton Spinners and Manufacturers
Crackers Cutlery

Dairies and Dairy Products
Department Stores Docks
Drug Manufacturers
Drug Wholesalers

Electric Goods Engravers
Express Companies

Factories
Felt Manufacturers
Flour Mills Food Products
Foundries Freight Houses
Fruit Packers Furniture

Glassware Gloves
Groceries, Wholesale

Hardware Manufacturers
Hardware, Wholesale
Hat Manufacturers
Hay and Grain
Hospitals Hotels

Ice Cream

Jewelry

Knitting Mills

Laundries and Wet Wash Laundries Leather
Libraries Lumber

Macaroni Mail Order
Machinery Meat Packers
Metal Workers

Newspapers

Offices Oil Refiners
Optical Goods

Packing Paint
Paper Pianos
Plumbing Supplies
Post Offices Preserving
Printers Publishers
Pulp Mills

Railroads Restaurants
Rubber Goods

Seeds Shoes
Silk Mills Silversmiths
Soaps Spices Sugar Refiners

Tailors Tea
Textiles Tobacco

Warehouses Watches
Wholesalers Wood Pulp
Wood Workers Woolen Mills

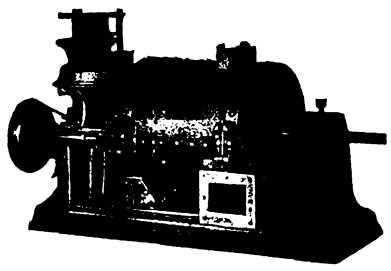
THE LAMSON COMPANY
100 BOYLSTON ST., BOSTON, MASS.
Branches Everywhere

LAMSON SERVICE

Lamson Conveyors

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Pulverized Coal



The Aero Unit System

of Pulverized Coal again demonstrates, as in other work of human endeavor, how an original idea at first worked out by complicated and costly methods is finally simplified and perfected until it becomes a part of our every day existence.

The Unit System reduces the equipment and therefore the cost to a minimum by placing the Aero Pulverizer at the furnace where the coal is fed to the machine undried and is exhausted therefrom directly into the furnace. There are no dryers, no storage or long lines of transportation for the powdered coal, thus eliminating the hazard of fire or explosion.

Each Aero Pulverizer is designed as a complete powdered fuel unit for one furnace. They are built in standard sizes ranging from 600 lbs. to 5000 lbs. of coal per hour.

Bulletin Sent on Request

AERO PULVERIZER COMPANY

165 Broadway New York

How the Big Executive Keeps Fit

(*Continued from Page 22*)

the many records of men who keep fit because they regard their physical well-being as an exceedingly important part of their equipment. What good examples our tennis playing, golfing presidents have set and General Pershing assiduously playing polo with the Army team!

One of the most encouraging stories is one I recently had from a Time Clock. In the perfection of terse style it figured out the ups and downs of the sales manager of the John Barton Construction Company, where everyone from president to office boy punches in and out on the fateful little dial. I'll call my case Ralph Fleming.

Old Mr. Barton brought me the first chapters one day when he came in for his annual examination.

"Look at it, doctor, wouldn't you say that young man is either sick or slacking?"

I examined the time card's record of Ralph Fleming's morning arrivals. Here are three which summarize the story:

January 6th, 1920 8:39
November 9th, 1920 9:10
February 3d, 1921 9:29

"Doctor, three years ago, when I first took that boy on, he was fresh from a small town and there never was such a cub to chew up the work. I've advanced him steadily. I need him. But he's slumped. He seems asleep half the time."

"Well, Mr. Barton, what poisoned your pet?"

"That's what I want you to find out. Unless he gets over his sluggishness, in six months he'll find over his desk a sign reading, 'Choose your exit now.'"

When Ralph Fleming was sent in for his examination I was interested to see that although his family and personal history were good, there were serious faults in his daily habits. He was told he had five things to do: (1) Go to an occulist for reading glasses; (2) cut down his cigarette allowance; (3) have a carious tooth extracted; (4) follow our diet suggestions with increase of fruit and reduction of pastry, tea and meat; (5) exercise each day vigorously.

Of course I didn't know how seriously the young man would take these commands. One never does know. But I was interested in this case and about six months later I encountered his chief and asked him about the sales manager.

"I've the latest records with me. Ask the Time Clock—he knows." I looked at this historian's last chapter:

May 1st, 1921—8:50
June 15th, 1921—8:50
July 2nd, 1921—8:45

"And is he as energetic as that looks?"

"Every bit. He's done everything you told him and certainly has, what the Time Clock shows, his punch again."

The Barton Construction has saved a good man because he, himself, found out and corrected his difficulties when it was easy to do it. The periodic examination saves careers as well as lives.

This rebound to health is unusual, however, because the big executive is often stubborn, enslaved to some ruinous habit or completely lacking in that sense of proportion which health requires. The goal of success—power, money social recognition—whatever it is, is hardly worth reaching without health. The business man too often forgets the present because he is living so hard in the future.

"Why didn't you go to the dentist when I urged you?" a doctor asks his patient.

"Well, doctor, I just never had the time."

This man of vision and foresight was the efficiency engineer of a large manufacturing concern in Bridgeport. What would he say to a foreman in his shop who let his machines get rusty, who let them run on with faulty parts or frayed belting, offering as his excuse that "he never had the time to get them fixed?"

He'd fire that foreman in a twinkling. Why? Because it's obviously dangerous and wasteful not to keep expensive machines in the best possible condition. Yet the engineer neglects his own mechanism without a qualm, surprised and vexed if it ever gives sign of degeneration.

American business men, judged by the information accumulating in insurance companies and examining clinics, have four bad habits which threaten their health and therefore their enjoyment of success if they live to attain it: lack of routine daily exercise; eating without regard to weight or proper elimination; over indulgence in tobacco; lack of sleep and relaxation.

These bad habits explain, at least in part, the shocking prevalence in this country of degenerative diseases of the kidneys, heart and circulation, and this means that an immense amount of suffering and waste might be saved.

The busy, hard pressed executive who carries great responsibilities, is subject to the nervous tension of quick decisions, to contest and to the direction of others, and whom America so much needs, should be given some positive suggestions to help him keep in good running condition.

Physical inactivity ought first to be conquered, because it brings with it other evils. Modern men of action do not need to be muscular. H. G. Wells once described them as essentially "lazy men with active imaginations." But sufficient exercise to keep the muscles firm is necessary to good posture, to proper circulation, to the elimination of waste and poisons from the body.

Nowadays in our highly organized city life we have to *will* to exercise, since neither our sedentary work nor our sedentary play at movies and ball games, require it of us. What's more, it must be regular. The Sunday spent on the golf links does not make up to the bank president for his six days of neglect.

"Is there one thing on which I can concentrate, doctor, which will keep me fit?" The man who asked me this is a civil engineer of wide reputation.

"Yes, you can walk four miles every day, so briskly that you start a perspiration."

"I haven't time. Why, that's a long walk."

"Can't you walk half an hour on going to work and half an hour going home. Do twenty-four blocks on foot."

"Well, if that will keep me fit. I'll manage to do it somehow."

Athletic clubs, providing gymnasium, handball courts

(*Continued on Page 52*)

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How 500 Plants Are Fighting High Production Costs

THERE IS a new and growing realization in many of the leading industrial plants, of the important part played by the foremen, in the struggle for greater economy of operation.

Keener competition for orders has pointed out the necessity for speeding up inside the factory, with every man producing to the utmost of his capacity, and every dollar of unnecessary expense cut away.

No matter how carefully you plan economies in the office, it is the foreman in the shop to whom you must look to carry out these policies of economical operation. He is the one man who can see that you get 100 per cent value for every dollar you spend for labor.

A Larger View of The Foreman's Duties

Can the foremen in your shop measure up to the responsibility of the present situation? It takes more than a knowledge of machines and processes. Instead of machines, they must handle men. In addition to processes, they must carry out policies. This is a big job—so big that the better plants are beginning to see that their foremen should have special help and training to meet the needs of the present situation.

How Leading Companies Are Training Their Foremen

Many companies realizing the need of developing the executive ability of their foremen, have sought to fill the gap by conducting regular foremen's meetings at which the routine problems of the shop are discussed.

A far better and more practical plan is to give their foremen and other key men about the plant an intensive group training in modern production methods which will develop their executive ability.

Because of their success in adapting this training plan to the peculiar needs of foremen, the Business Training Corporation, of New York, has been engaged to carry on this work in more than 500 leading plants representing almost every type of industry.

The popularity of the course with the thirty thousand employees enrolled is due to the clear, simple, and eye-opening nature of the study methods. The foremen like it because it holds their interest throughout and leaves them with a new insight into their jobs. It has made good with the management because it develops a greater spirit of team work in the plant, energizes the men to more productive effort, and has an appreciable effect in reducing labor turnover and costs.

The results of the course are thus summarized by Mr. E. B. Freeman, General Manager, B. F. Sturtevant Co., Boston, Mass.

> *". . . . . As for the results accomplished, they are apparent to one on every hand. Our men take a keener interest in their work; they are more amenable to improved methods for their departments, and their ambition has been aroused to make their departments and themselves more productive.*

Your big problem today is economical operation. You should therefore read our brief report "Making Better Foremen," which we gladly send to executives without obligation. It gives all details of our unique plan, and the experience of some of the well-known concerns who have used it.

Business Training Corporation

"Greater Team Work Through Group Training."

185 Madison Avenue *New York City*

Business Training Corporation 185 Madison Avenue NEW YORK, N. Y.

Send me without obligation the Special Report, "A Plan for Making Better Foremen."

*Name*_____

*Company*_____

*Address*_____

*Position*_____

*Number of Employees*_____

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BONES AND BUSINESS

Bones stepped into my office the other day and after the usual friendly good morning—(Bones always has a 'good morning' that makes you feel good) said, "Mr. Smith! what do you know about your business?"

I thought this was pretty nervy of Bones and told him I had put in my own cost and accounting system and that last year we knew just where we stood and that I wouldn't take any man's word for the facts but absolutely depend on my figures.

While I was going into detail along this line, I noticed that Bones had a peculiar expression on his face and it got my nerve so I exploded with a "What the——have you got up your sleeve Bones?"

"Well Sir" he came back with, "Do you budget the return of your loans and obligations as well as sales, purchases, production and costs? Are you sure that your manufacturing, purchasing, warehousing and financial methods are the best?"

Both of these questions I could not answer, and frankly admitted so.

So Bones said "Smith you need the services of the organization that has put my plant on its feet. You know that a couple of years ago we couldn't make head or tail of things and everything seemed to go backwards. Well this outfit came along and studied the manufacturing, warehousing, purchasing methods, etc., then their engineers got together with us and laid out new methods of procedure, routing materails; we changed around a couple of machines which saved us over $5,000 in a few months. Then their sales engineer set up an intensive sales plan which increased our sales about—% in the second period."

"After we had gotten fairly underway they fixed up prospective earnings statements, budgets, etc., to show relative costs and expenses and when we sent these out to the banks we could see how differently they felt towards us right away. And say, Smith!" "When the general report of our condition came through on the first of the year you ought to have seen the way the Board sat up and took notice. I tell you, Smith," Bones said as he picked up his hat; "you should think it over carefully; they have the best bunch of expert operating executives you ever met, every one of them has had years' of experience in his particular line. They sure do know how to straighten you all out and set everything running smooth."

"So long, Old Top!"

After three or four days the real significance of Bones' talk filtered into my head so I called him up and asked him how much all this would cost and who they were.

Bones said, "Anyone in your boat can afford to pay the price for these people's service and all you have to do to get all the dope is to call Hanover 6076 and they will send a man over who will hand out the whole pie. By the way if you forget the 'phone number here's the name and address."

THE MANAGER
23rd Floor
43 Exchange Place,
New York, N. Y.

(*Continued from Page 50*)

and swimming are splendid, but if a man cannot afford membership he may still get, every day, the necessary exercise in his own room. Ten minutes of hard work night and morning will keep a person in good muscular condition. Excellent series of exercises are available now. Remember that some form of ill health will get you if you don't work. Use your muscles as religiously as your tooth brush!

Diet is a vast subject. Moreover it is hard to generalize about food. A man suffering from constipation, the man overweight, the one with some physical impairment, cannot eat the same food as the average man.

A few simple rules, however, can well serve the average person. Foods that furnish physical energy are the cereals, sugars and fats. Foods that build up the bone and muscles are the proteins found in meats, cheese and many vegetables. Energy food is much more needed than proteins. Bulky food, such as greens, spinach, cabbage, etc. and especially fruit should be eaten once a day as an aid to elimination and for essential nutriment. Remember that brain work requires much less food than physical work. For sedentary workers, one hearty meal a day is sufficient, since whatever the body cannot burn up by muscular activity goes either to waste or fat. (Watch the scales and base the amount you eat on their report.)

It is bad to eat when tired after special strain. A better program is to take a little light exercise, rest and a bath, then some light refreshment. Men who go to luncheons and dinners to discuss important problems with their confreres are apt to eat a needlessly heavy meal that impairs mental activity and clear thought. Even though hospitality and convention requires the ordering of an elaborate meal it is possible to eat lightly of each course and thus escape dietetic and mental embarrassment.

"What a baby that man is." I heard a man comment recently about an important executive. "He thinks he cannot dictate a letter without pulling at a long black cigar, like a baby with an all-day sucker. Without it, he's so nervous and cranky, the stenographers can't do a thing with him."

It is well to remember that smoking in the open air during hours of recreation is much less harmful than when the brain is active. Keep your allowance of nicotine low in order to avoid its undoubted strain on the heart and lungs. An easy rule to follow, established already by all efficient offices, is to prohibit all use of tobacco in working hours. This saves the executive who is too good a sport not to obey himself the rules he makes for others.

Men who last are those who can play, who refuse to make of themselves machines for work, but who drop it at the day's end. Men hate cowardice and if they realized that worry is but a series of fear states, they would rid themselves of it as they would of fear of the dark.

Eight or nine hours of sleep, particularly for men and women beyond the age of thirty-five, and some out of door recreation ought to be part of the regular program for everyone who is doing a big job in a world that needs the services of big men.

The professional or business man has to enter sharp competition, face financial crises; it is his duty to persuade, sell, create an atmosphere of trust and good faith. He prepares for this endurance test too often by over-working, over-eating, neglecting sleep and whipping his nerves with what stimulant he may command. He must learn that his physical well being enters into his success. He ought to prepare for it as do the runners in a foot race. Fancy the pugilist entering the fight without a course of training!

Executives are leaders and are observed by all the rest of us. Every fat man took heart when Chief Justice Taft successfully lost so many pounds. If these men kept clean and keen for the race, they would do much to kindle anew the vision of glowing and radiant health.

Signalling the Cost Range

(*Continued from Page 16*)

size and general arrangement as possible, so that the executive can at once place his finger upon desired information for any department or phase of the business. Figures of unusual interest will be indicated by blue underlining, and those requiring immediate attention or correction by red. They will include labor figures of idle time, productive time, bonus, and overtime, in man-hours and dollars (the latter three each compared to output); material stocks and goods in process in dollars, quantities, terms of finished product, and where practicable, time and amount of investment in terms of output. Idle time of machines should be reported with reasons for stoppage. Overhead should be shown as applied upon normal capacity basis, separate from the additional overhead due to subnormal conditions and which is chargeable to profit and loss. It may be well to call attention here to a decision made by the Committee on Standardization at the recent convention of the National Association of Cost Accountants that normal capacity basis is the total possible time less reasonable allowance for breakdowns, inefficiency, etc., outside of lack of orders to run on.

This outline of basic facts to be prepared by the cost department is necessarily very general, and must of course be modified or amplified to meet individual requirements.

And now to briefly state the general uses to which these figures should be put:

1st. As a means of eliminating wastes;
2nd. To set up standards for current production costs;
3rd. To serve as a guide to selling and pricing.

Nor should the executive stop at the consideration of these reports for his personal guidance. Excerpts of them should be promptly sent not only to foremen, but even to labor, containing those facts which will, by comparison with previous records, inspire them to greater endeavor toward a higher goal.

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What Germany Offers Her Blind

(*Continued from Page 26*)

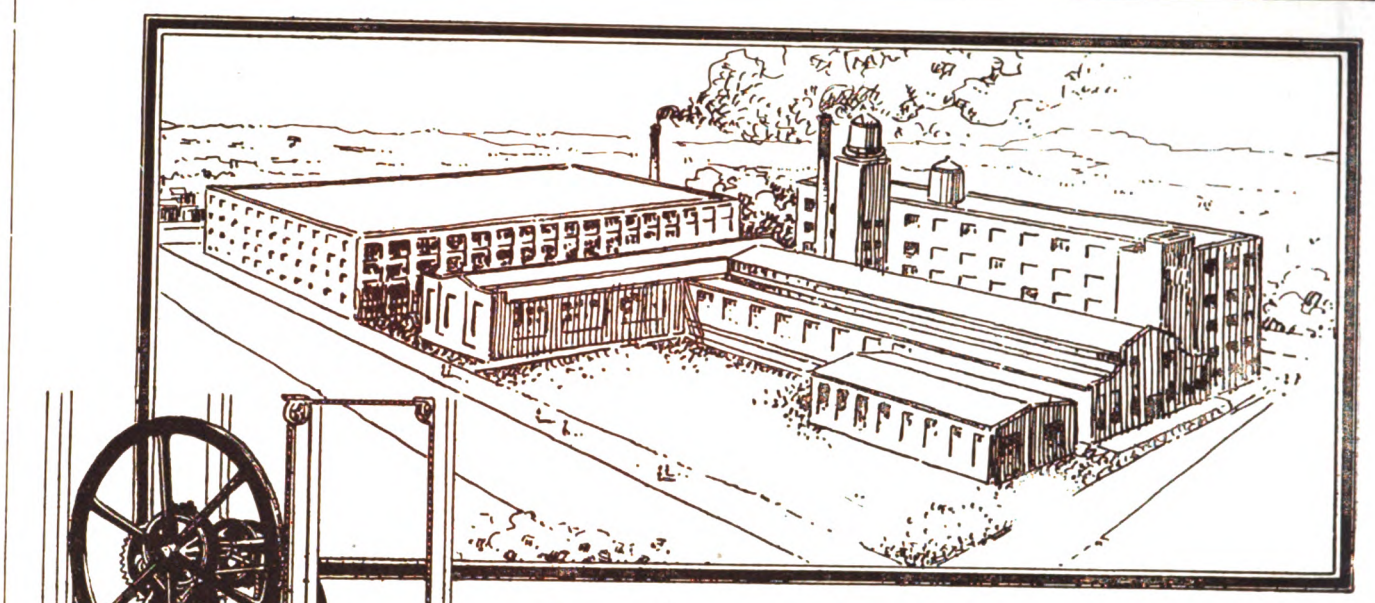
blind should so far as humanly possible, have their hard fate eased and their vital energy increased. At the present time there are in Germany 3,122 men who lost their eyesight in the war. The pioneer work on this vital problem as here described, was done by Mr. Perls, a director of the Siemens-Schuckert Works at Siemensstadt near Berlin.

The Siemens-Schuckert Works in 1915 had an order to supply an electric boiling plant for tar used in the manufacture of brushes for the Asylum for the Blind maintained by the City of Berlin. When starting this work, difficulties arose which demanded Mr. Perls' personal attention at the asylum. In this way Mr. Perls first came in contact with the blind and had an opportunity to watch them at their work. He soon recognized that at the extensive works with which he is connected and in which many small articles are manufactured as mass production, some of the operations could be carried out by the blind, and a number of men were put at his disposal to enable him to carry out experiments. The difficulties proved, however, greater than anticipated. Employment on auxiliary work, packing, etc., proved unsatisfactory, as the blind were not interested in this kind of work and became liable to loaf. It was therefore decided to employ them at automatic machines. To date, more than 150 blind have been trained to handle automatic machines of various kinds and some of them have been passed on to other shops.

The first principle laid down by Mr. Perls for the employment of the blind, and which has proved itself absolutely correct, is that they shall not receive charity. They must rather by appropriate training be brought to such a high degree of skill that they reach the efficiency of normal men and can obtain a good living by their own efforts. Only in this manner can the enjoyment of life be revived and maintained. Experience has proved that this aim can be completely reached, if a suitable selection is made and appropriate work provided.

In accordance with the practice followed in institutions for the blind it was at first considered advisable to keep the blind separate from the other workmen in order to treat them in a manner adapted to their peculiarities. If the experiences with this plan proved not satisfactory in the case of the ordinary blind, inasmuch as the work turned out was found not to be sufficient, the separation of the blind from the workmen proved a failure altogether in the case of these men. The mingling of the sightless with the other workmen proved itself advantageous from all points of view and especially in consequence of the squad competition which arose between the two classes of workers and which soon stimulated the blind to a considerable increase in efficiency.

(*Continued on Page 55*)



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(*Continued from Page 53*)

Mr. Perls holds that as the blind receive no external stimulus in the shop, it is advantageous to get the same work alternately done by other workmen. The manual work soon loses its appeal; the blind prefer, in accordance with their former occupation, to guide the work done by machinery. It is also possible that the noise made by the machine puts them more in touch with the progress of the work and facilitates their understanding of what is going forward. Furthermore the earnings in the case of machine work are considerably higher, which fact must not be left out of consideration.

When employing the blind to serve machines it is of the highest importance to safeguard against all possibility of accidents. Machines and tools must be so covered that contact with moving and rotating parts is impossible. In Germany the labor associations, which are responsible authorities for accident insurance, are the guardians for the safety of machinery against accidents to the operator. The labor associations, making use of the powers vested in them, refused to allow the employment of the blind until they had satisfied themselves that safety appliances were such that accidents could not possibly occur. In recognition of this fact the labor associations now undertake the insurance of the blind working at machines to the full extent of their liabilities at ordinary premiums.

Experience has shown that as drive for the machinery the individual electric drive is the most suitable, as dangerous transmission belts or line shafts are entirely obviated.

The duration of the work of the blind must not be extended too far. At first the opinion prevailed that in accordance with medical advice the employment should not extend above six hours per day. It was soon found, however, that the blind themselves had the desire to work longer hours. At present they have the same number of working hours as the able-bodied workmen, which means according to the regulations now prevailing in Germany, eight hours per day. During the war the blind frequently worked ten hours without showing weariness.

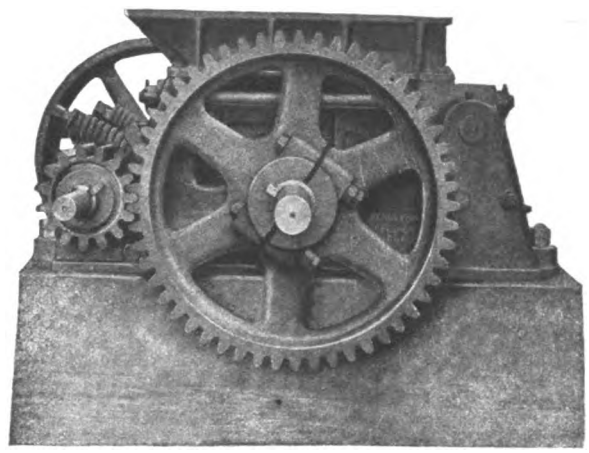
Personal contact of the management with the blind workers is absolutely necessary. The manager as well as the foreman must assume a quiet and determined attitude; they must fully sympathize. with the special wishes of the blind and grant them to the best of their ability, take an interest in their private concerns and allow them all facilities compatible with the conditions prevailing in the works and which may possibly increase the efficiency and the output of the works.

Provisions must be made that the blind may be safely conducted from their homes to the works. In most cases fellow-workers or wives undertake this care. If the guidance is performed by a person not connected with the works, the worker is too much dependent upon his guide. It is therefore advisable to make provisions that he be conducted by a person employed at the same works. The guidance by specially trained dogs has proved very satisfactory as the dogs willingly perform all the services desired by the blind. During working hours the dogs are kept in open spaces or sheds adjacent to the workshop and are fed with kitchen refuse from the canteen or refreshment rooms. Some of the blind have, however, a strong disinclination to trust themselves to dogs. According to all experience at the Siemens-Schuckert Works the dog is, however, the best and most reliable guide and companion for the blind.

For what sort of machine work is the blind most adapted? Some points concerning this question have already been touched. Fundamentally only such work is suitable which is extremely simple and the various operations of which follow in a definite sequence. The most essential condition for the performance of even the simplest work is the provision of appliances which allow the sense of sight to be replaced by the sense of touch. In this regard great demands are made upon the manager and foreman of the department, who by untiring study of the ways of the blind and their pecularities must constantly endeavor to improve the appliances in use. The appliances must on the one

(*Continued on Page 59*)

"PENNSYLVANIA" SINGLE ROLL COAL CRUSHER



Preparing Coal For Your Stokers

Ordinary bituminous coal at destination can be crushed readily enough without imposing serious work on the Crusher.

Numerous installations have been made on this theory, with the Crusher as an obscure part of the general coal handling machinery contract. Serious trouble has often been encountered in such cases, due to the fact that many different kinds of coal must be handled in times of shortage, and large tramp iron is often mixed with the coal.

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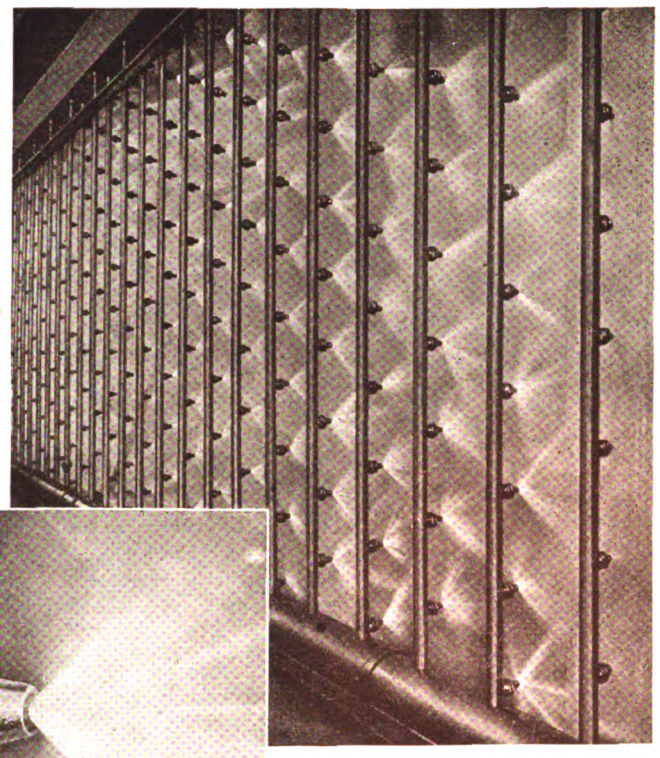
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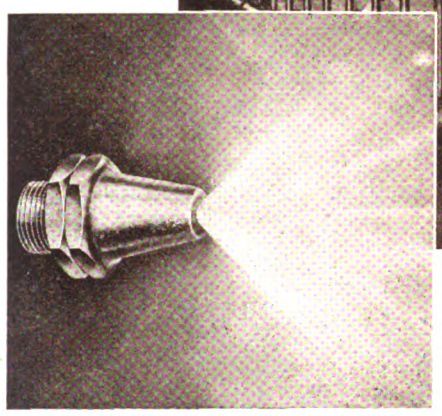
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Apparatus for Maintaining Artificial Atmospheric Conditions in Industrial Plants

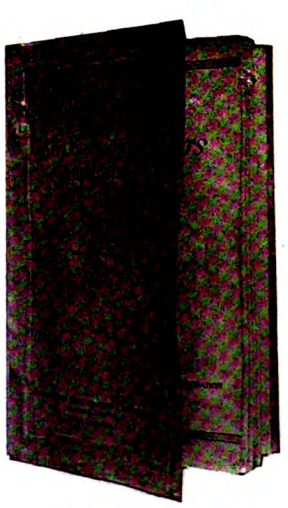
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"Considering its relative intangible nature is it not strange, perhaps, that it should be overlooked, yet it may be stated without fear of contradiction that every industry is adversely affected in some measure by the wide annual range of atmospheric characteristics."

"The importance of temperature has always been taken into account and its annual range indoors artificially restricted to a large degree, but the more subtle element—humidity—has been allowed to rove in its natural wildness. The relations of temperature and humidity to the efficiency and well-being of men are quite generally recognized, but their effects upon materials, manufacturing processes and the uniformity, quality and quantity of production have been very generally overlooked, though it must be said that consideration is being given it now in a rapidly increasing measure."

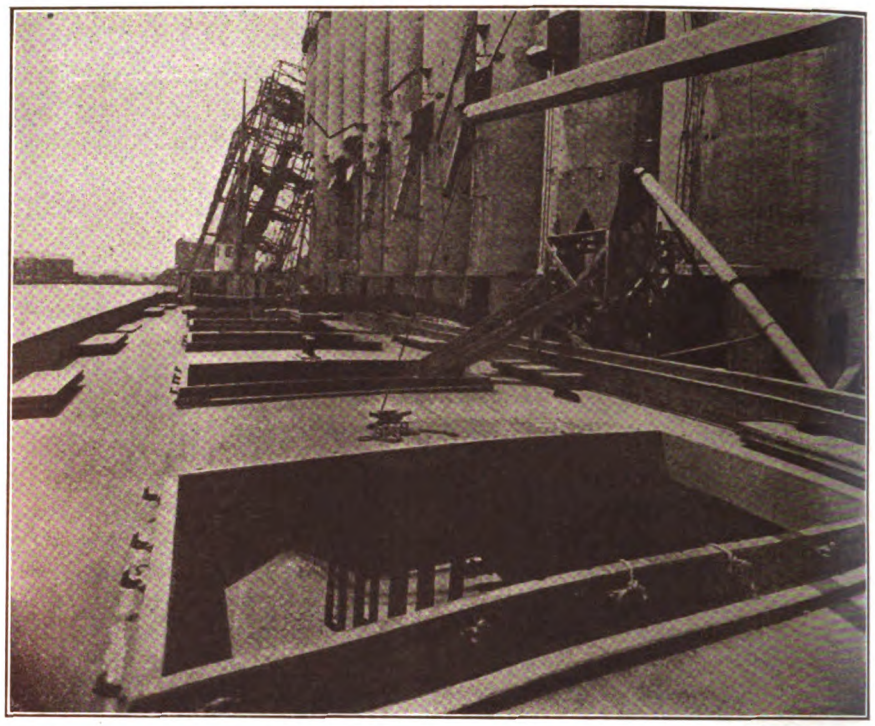


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Air Salvages Grain From a Wrecked Elevator

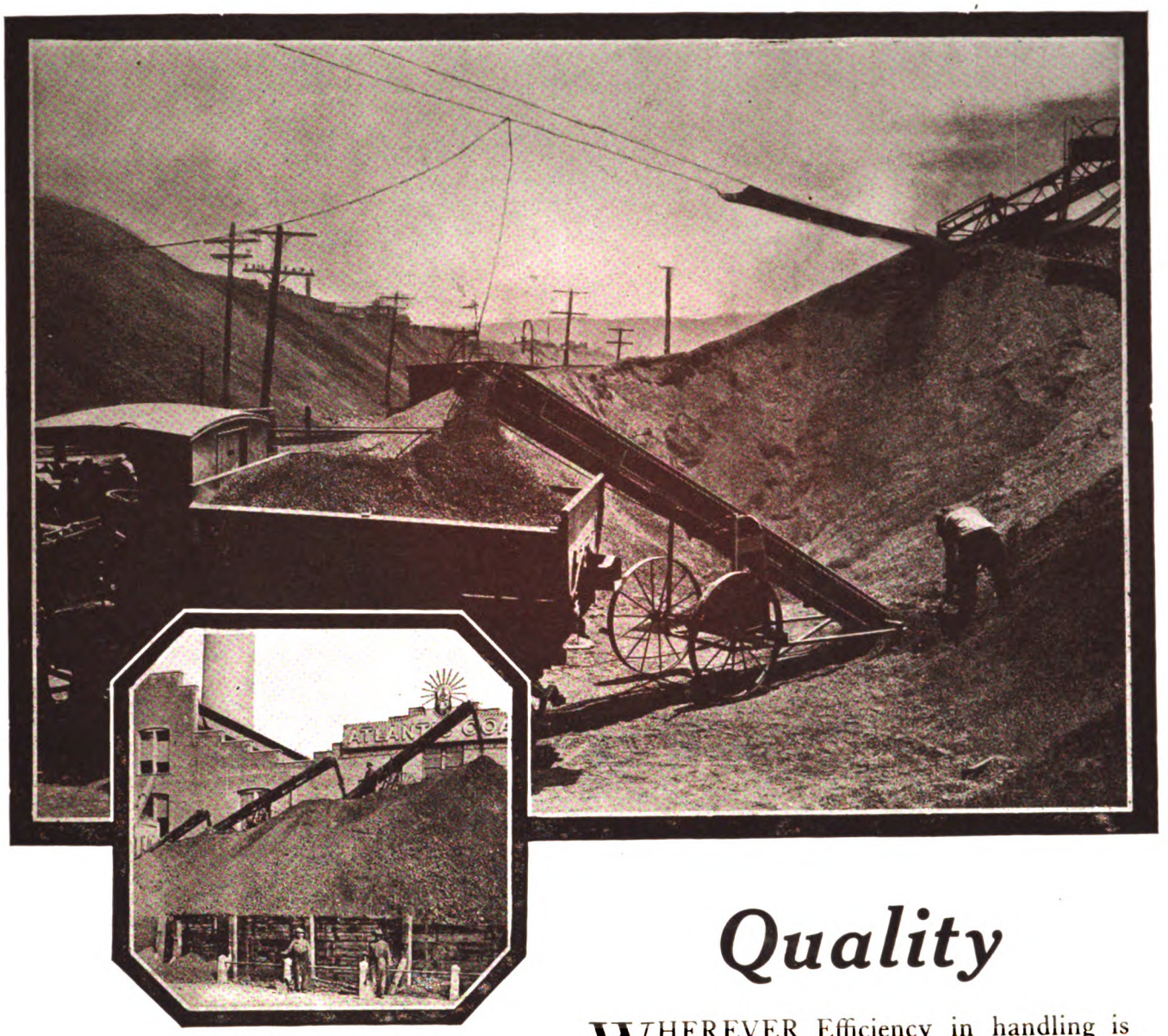


A view of the water side of the wrecked Armour Plant at Chicago, showing the demolished grain unloader and superstructure in the background. In the middle foreground is shown the vacuum tank of the salvaging air conveyor, discharging grain into a steamer for transfer to another plant where it can be cleaned.

FOLLOWING the dust explosion which last summer wrecked the great Armour Elevator at Chicago came the problem of salvaging some 6,000,000 bushels of grain within and around the wrecked structure. The handling of this grain by scrapers, portable conveyors, trucks and manual labor was a slow process and it was decided to use the pneumatic method. Two pneumatic conveyors were installed; one on the river front for discharging to steamers, and the other at the north side of the structure for loading the grain into cars. The illustration shows the installation on the water side. The separating tank is mounted above the wharf to permit spouting directly to the hold of the steamer. The suction pipes extend through the passageways beneath the bins. The separator tank is mounted on a temporary structure and can be shifted from point to point as the salving proceeds. The exhauster maintains a partial vacuum within the tank and the induced air blast draws the grain to this point. The grain passes downward through rotary air-lock discharge gates, while the air passes out at the top. This unit salvaged oats at the rate of 3,000 bushels per hour with a 75 h p exhauster.

This is the greatest grain salvaging problem on record. The workhouse bins, with few exceptions, remained intact and these were readily emptied by an emergency track through the house and direct spouts to cars. Some fourteen great storage bins on the south side were blown open and with but little power available, scrapers, wagons, trucks, and portable conveyors were put to work getting the exposed grain into cars placed on an old construction track. The double row of bins of the river house were more or less wrecked, allowing the basement of this section to fill with grain. The two hundred and twenty standing bins of the main plant, each with a capacity of 30,000 bushels were lifted as a unit by the force of the explosion and dropped back on their foundations. At the same time the blast toward the sides wrenched the bin spouts and many gates loose as though by the hand of a giant. Any attempt along the usual lines of salvaging here would have been extremely costly, as well as hazardous. The pneumatic method solved this problem: one or two men doing the work of the large gang otherwise required, and doing it at a speed out of all proportion.

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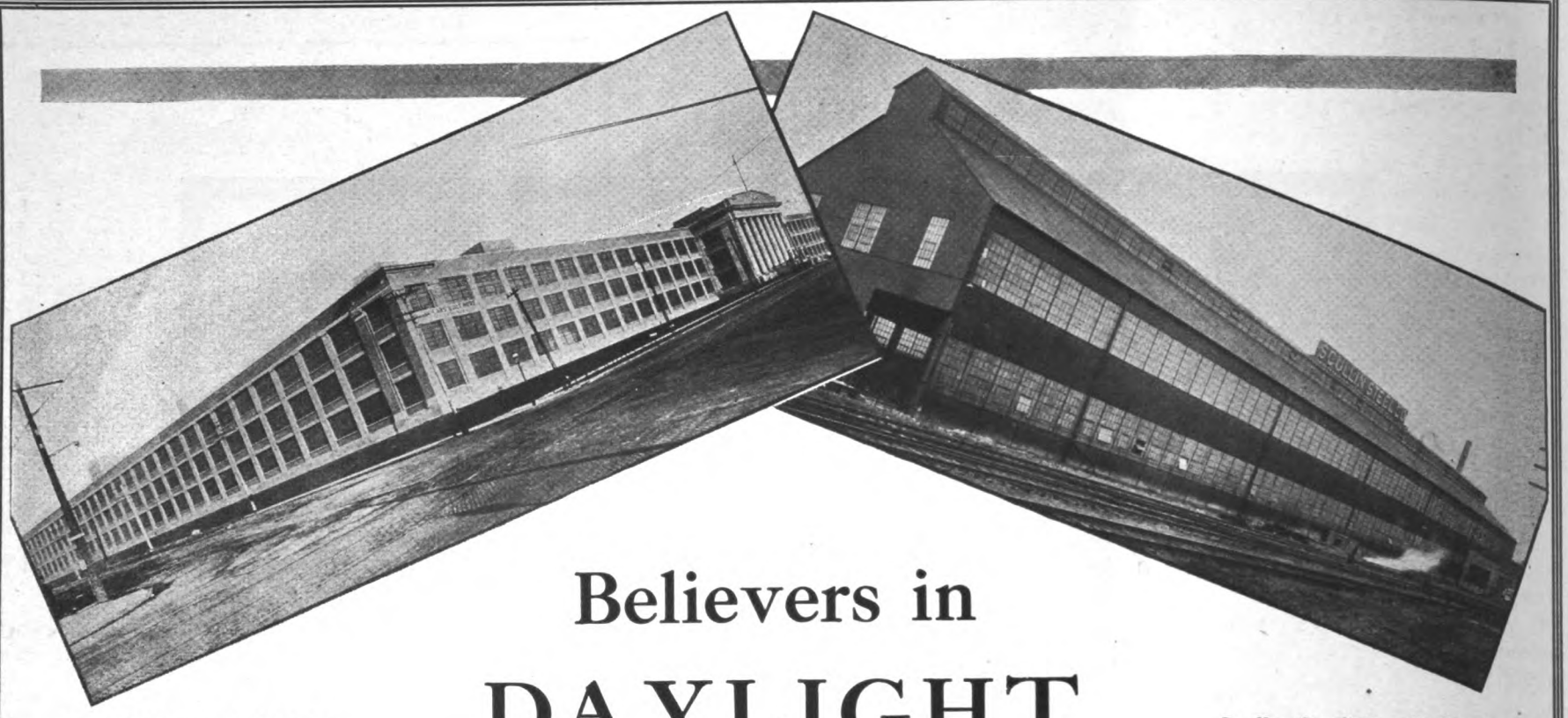
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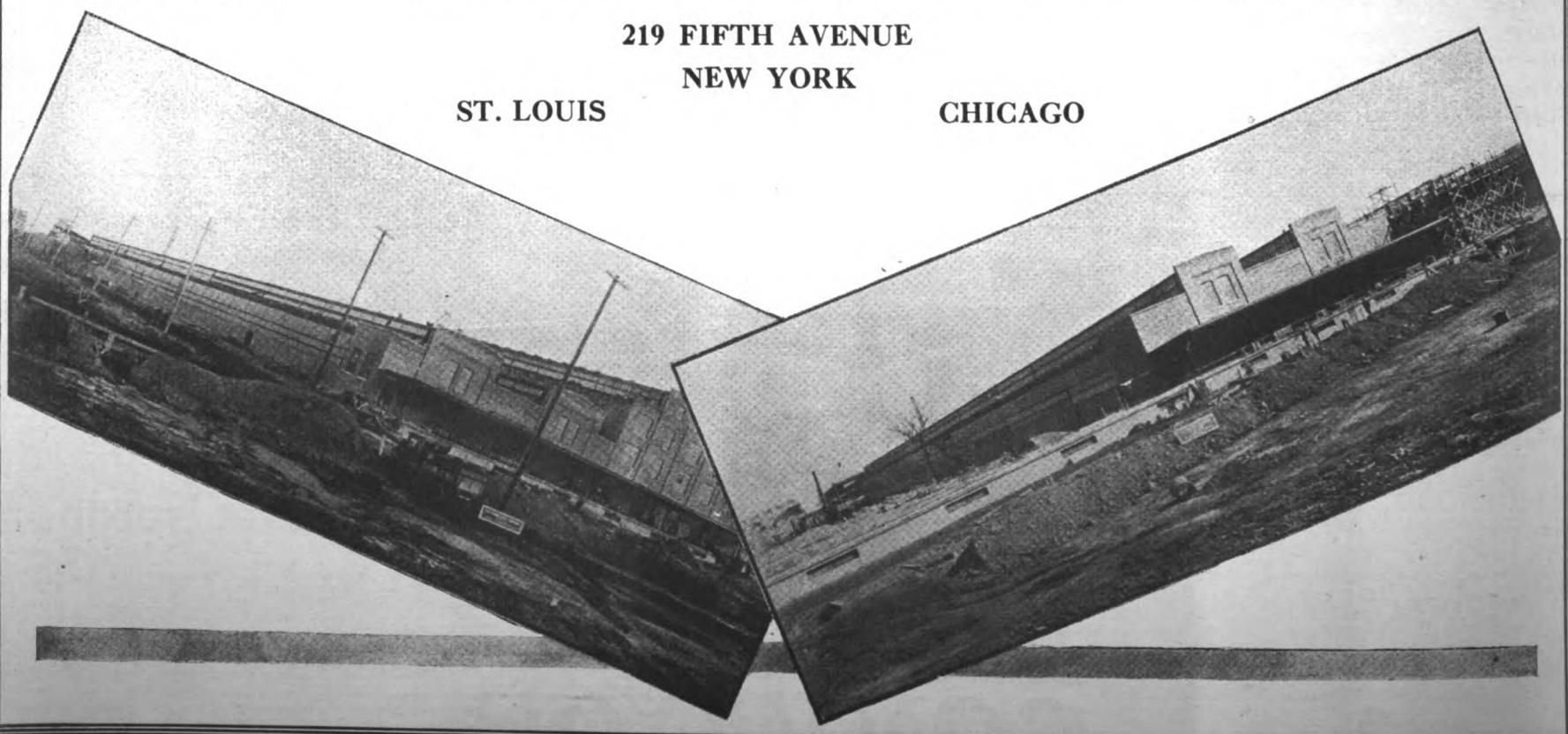
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(Continued from Page 55)

han I offer all imaginable facilities to the blind and on the other hand increase the output as far as possible and should finally lead to new occupation-possibilities for the blind.

As near as possible the operations and the machine adjustments should remain unchanged in order to enable the blind to acquire greater skill, higher speed and thus to enable them to gradually increase their earnings. Such work should be selected which extends in many similar and simple stages over considerable spaces of time. The conveyance of the materials to and away from the machine, the oiling and adjusting of the machine can, of course, not be effected by the blind themselves. The transport question may in certain circumstances be solved by installing traveling tables in the form of endless conveyor belts, whereby this work could be facilitated and cheapened.

Work given to the blind must in each case be adapted to individual inclinations and physical capacities. Physically strong men demand as a rule an occupation which is not sedentary and in which the body is given an opportunity to work. Mr. Perls tells of a blacksmith who was first put to a sedentary occupation, but soon began to suffer from fatigue in the nether part of his body. After a fortnight's interval he was put to work at a drilling machine where he had to stand up. This work he was able to perform continuously without injury to his health. Similar experiences were had with a former engine stoker. Of the multitudinous appliances and work performed by the blind only a few can be shown. The Siemens-Schuckert Company has after long experience arrived at the conclusion that almost any work that was formerly performed by women can now be performed by the blind with the aid of suitable appliances.

. It was recognized from the beginning that it was necessary to inspire the blind with the thought that they were doing valuable work, work which was appreciated; in order not to rob them of the pleasure in work accomplished. They are therefore guaranteed 2,10 M. per hour as minimum pay, which for the beginning is considered as assistance, but which, as experience shows, does not continue for long. After a short time they are capable of earning considerably more, The average pay per hour of blind workers amounts to more than 4 M., while the pay for able-bodied workers at Berlin is at present about 7 M. The income of the blind is supplemented by the pension as war invalids as well as by extras fixed by tariff to make up for the high cost of living; which amounts to 9 M for the wife and 18 M. for each child, per week. All the blind are thus in a position to maintain themselves and their families in comfort, if not in luxury. They do not become a charge on the public nor are they humiliated by receiving charity, but feel themselves on the contrary, useful and fully capable workers.

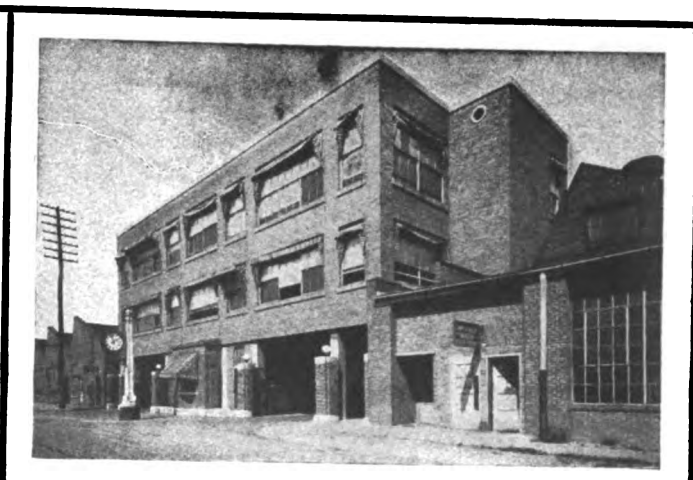
Making Costs Prophesy

(Continued from Page 16)

facture or in other parts of the organization and the executive should know just exactly where to watch for such failings as his figures show. It is more important to know that you are receiving value for what you have paid for, than to know what you have paid for it, and it is just this that the executive should look for from his system.

Needless to say, the executive must have a thorough understanding of the processes and activities to which the costs relate, otherwise, he cannot hope to properly analyze Cost Statistics.

Although this little talk is essentially on "Cost Systems" as they affect the executive, this same executive should not depend entirely upon this source of information, only, he should know the physical aspects of the case as well and be able to co-ordinate his understanding of the physical and accounting work to obtain best results.



Main entrance to the manufacturing plant of THE WILLYS-MORROW CO., at Elmira, New York, where "MRBN" Engineers designed the complete plant totaling 1,000,000 square feet of factory floor space.

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"DESIGNERS OF BETTER INDUSTRIAL PLANTS"

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How Stands the Score?

(*Continued from Page 17*)

ers. All of them know that they must get figures concerning the condition and operation of their business and practically all of them are getting some sort of figures, at some time or other; but very few of them are getting succinct reports promptly enough to enable them to act decisively at the time when they could control or at least influence results.

This is undoubtedly because very few industrial executives are sufficiently versed in accounting to know what can be accomplished in the way of promptly and tersely reporting current events, and very few accountants realize the necessity of quickly presenting pertinent facts as they occur.

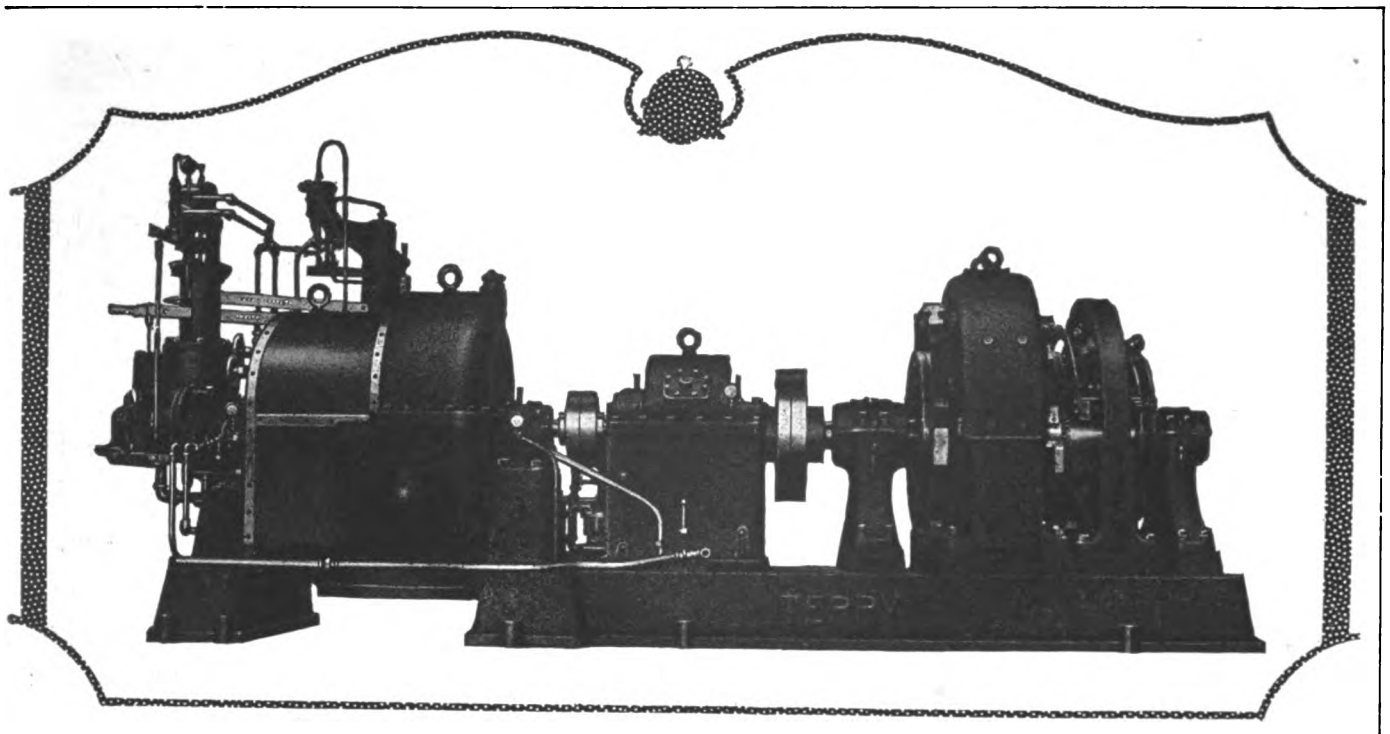
Most of the systems in use today have been devised by men who are well qualified to provide means for recording all the details of cost and production, but who seem to be sadly lacking in the ability to quickly determine and clearly portray the results of operation; and the executives, blindly accepting the methods provided as being the best obtainable, have failed to realize that the systems devised for them comprise merely the groundwork, from which the superstructure is lacking. As a result, most executives are getting delayed reports of long past operations, replete with multitudinous details which serve only to confuse, if not actually mislead, the very men whom they are intended to enlighten.

Another difficulty arises from the fact that very few professional systematizers are thoroughly qualified to devise both adequate accounting systems and comprehensive shop systems. Consequently, many concerns have systems which are incomplete or defective in one branch or the other; and, where the accounting system has been installed by one expert and the shop system by another, there is often a lack of co-ordination which precludes the possibility of that harmonious functioning of both which is absolutely necessary to secure proper results.

The manufacturer of today needs a system, certainly, but it should be regarded simply as a means to an end; and, if it fails to attain that end, it should be condemned as inadequate. The most important thing is POLICY—financial policy, selling policy, cost policy—of which the system should be merely an adjunct. System is simply the machinery—useful, it is true, if properly run; but MAN is both the motive power and controlling force, and no system will be properly effective unless efficiently regulated. You must, therefore, dominate your system—not let it dominate you. Govern it with an iron hand and make it serve your purpose; for, after all, it is MAN who rules the industrial world and systems are but the means by which he accomplishes his purposes.

Can it really be done, do you ask? Yes, it not only CAN be

Continued on Page



Where Steam is Going to Waste

YEARS ago gasoline was thrown away, because it had no commercial usage. It was merely a by-product of the refining process of kerosene. Today the advent of the automobile has made this waste unnecessary.

Today there are also many plants where steam is going to waste—steam exhausted from hammers and other non-condensing steam operated or heated machinery. The fact that this steam may be going to waste periodically, or the fact that the quantity of waste steam is constantly varying, does not stand in the way of its being efficiently utilized in a steam turbine.

The Terry turbine with automatic mixed pressure governing mechanism is today in many plants converting waste steam into dollars in the form of power. The automatic regulating device permits the power load to be carried on waste steam, admitting extra high pressure steam when the supply of waste steam falls off. It also causes the turbine to operate as a straight high pressure condensing machine when there is no waste steam available.

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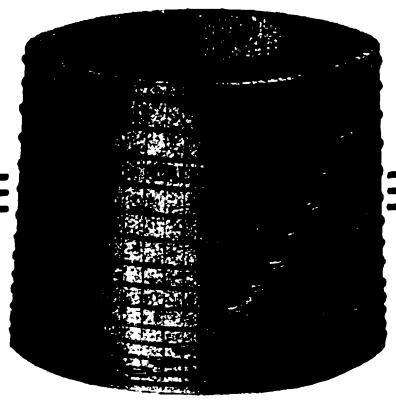
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(*Continued from Page 60*)

done,—it IS being done, and it has been done by practically all of the men who have been conspicuously successful in the industrial world during the past decade. The leaders of modern industry do not guess or wait for post mortem statistics, but exercise day-to-day control by action based on actual facts.

And, in obtaining these facts, they do not permit themselves to be engulfed in overwhelming details. Business today is past the one-man stage. Organization and distribution of responsibility relieve the chief executives of overburdening and often bewildering details. Condensed summaries tersely present final figures, while charts and diagrams graphically portray essential facts.

These comprehensive summaries and graphs are supplemented by more detailed reports which go to the various department heads, and these are supported by records which show all the items, so that any condition or result can be infallibly traced back to its exact cause; but all analysis and detail work is delegated to subordinates, who report their findings tersely to their chief.

As Mr. Ripley so aptly expressed it, "The executive's chief business is to organize, deputize and supervise"; and he might have added, "the hardest of these is to deputize," for many executives seem to find it impossible to relieve themselves of overwhelming details simply because they "cannot find time to teach anyone else how to handle them."

Developing Executives from Within the Ranks

(*Continued from Page 11*)

ognition as the coming center of automobile manufacturing. He recalled the first attempts at standardization of product and parts; and how these attempts were considered revolutionary over the entire manufacturing field. He said the quantity production systems in motor car making have greatly influenced methods in other industries. He told of some of the reverses that were met with, dwelling particularly upon the care and energy necessary to building up an organization such as the one of which he is the head.

"We always like to train our own men," Mr. Chapin said. "Occasionally it is, of course, necessary to go on the outside and get a man for some particular job; but insofar as possible we keep our organization built up of men who have gone through the mill with us. It is common knowledge throughout our organization that every man has a chance for advancement on his individual merits. If we have a man who proves himself capable, we push him along just as fast as opportunity offers.

"I know that I am talking an old theory, but with us it is more than theory; we make it a practice. We never consider looking elsewhere for a man until we have first taken stock of our own employees. All things being equal, we much prefer a man trained in Hudson principles to an outsider. Knowledge of this has done much toward building up the morale of our organization; and we have an *esprit de corps* of which I think we are justly proud.

"It has also been our experience that working conditions have much to do with the quality of product, a thing for which we are striving incessantly. We know that where competition is so keen and methods of standardization so universal, a concern's biggest asset is quality. And when we made an exhaustive study of European plants and methods preparatory to building the Hudson factory, it was evident that we in America had been giving too much time and thought to building up quantity production to the neglect of actual working conditions as affecting the workers—and this with a subsequent effect on quality.

"Our experience in erecting another big automobile plant had left us with a lot of construction ideas, which we augmented by a thorough investigation of both domestic and foreign methods; and we incorporated the whole of our ideas in the plans for the new

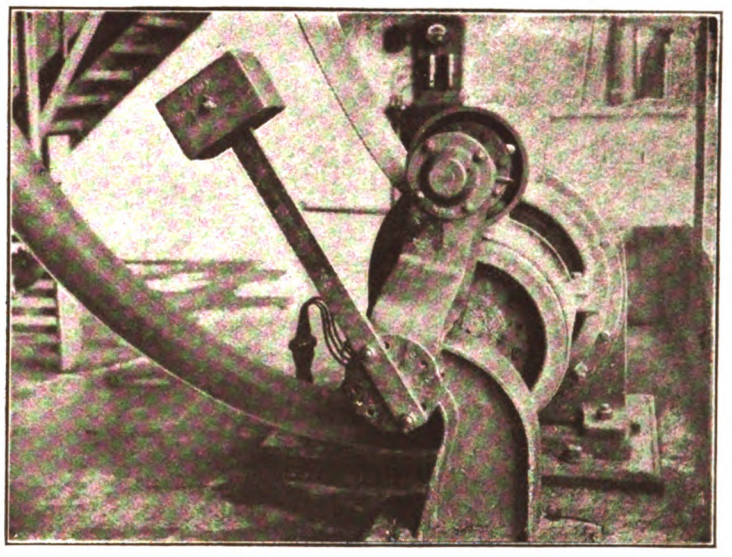
(*Continued on Page 65*)

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(Continued from Page 62)

Hudson factory. When completed our factory was as convenient, sanitary and generally pleasant as possible; and it has proved a wise investment for us. There is no doubt that Hudson quality is due in no small measure to the greatly improved conditions under which men and women work in our plants.

"The Hudson company is not a 'one-man' organization in any sense. We seek and encourage individual suggestions from all employees in whatever capacity they may be working. For years, in the alignment of our staff we have been carefully watching those of our men who have ideas on something more than the work just in front of them."

Mr. Chapin has an entirely enlightened idea of the problems of management. He holds that brains cannot properly be listed under the various headings in a rate book. The Hudson company has no fixed salaries for executive positions, thus differing from many other establishments. All executives are paid according to their various earning capacities; and it is significant that most of them now own good blocks of Hudson stock.

Mr. Chapin has an understanding of the workingman's problems which he has preserved from the days when he helped to make the first Oldsmobiles and learned how to operate every piece of machinery in the entire factory. Every officer in the Hudson company has come up through the shop; hence in all the problems connected with labor there is a keen appreciation of the viewpoint of the wage earner.

While he is not unmindful of equipment and plant facilities, Mr. Chapin puts his organization first. After years of the most practical experience in the building of high grade automobiles, he has come to look to this organization for super quality; for he holds that quality is the factor which spells success or failure in the building of automobiles under today's conditions. Quality alone can permanently succeed.

Has Marine Engineering Kept Pace?

(Continued from Page 6)

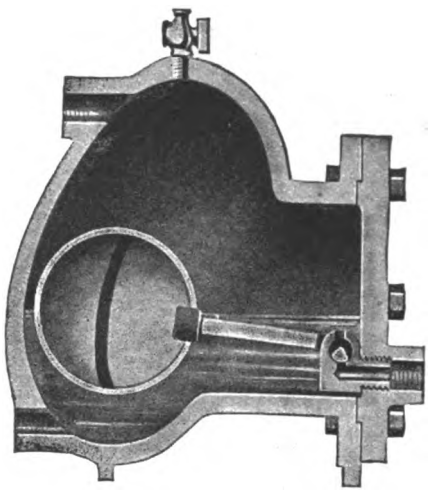
above us, were the silent, apparently motionless and totally inclosed steam turbines with similarly inclosed reduction gears to transmit their power to the twin propeller shafts. All of the old flavor of the engine room is gone and in its place is the atmosphere of the modern power house, motionless, almost soundless, but tremendous in efficiency.

"So there you have your answer. The coming of the steam turbine, the development of the reduction gear which makes it possible to apply the high rotative speeds of the turbine to more slowly moving propeller shafts; the Diesel engine and the electric drive which are already well over the horizon—these developments have revolutionized the propulsion of ships even though they may have caused little apparent change in the outer appearance of the hulls. Evidently then, marine engineering *has* kept pace, and perhaps when we compare its development to the changes in locomotive design during the same period, one may be safe in saying it has done more than keep pace!"

Mr. Coxe believes that the great merchant marine that we have built up in this country during and since the war, will undoubtedly, once this depression is over, have a great effect in stimulating American mechanical industries. And this not from the standpoint of stimulation of foreign trade but from the vast total of replacements and repairs required by an aggregation of mechanical constructions as complicated as our modern cargo ships. When one stops to consider that practically the entire mechanical equipment of a ship must be replaced about every twenty years, and also stops to consider the present aggregate of American ships, one-twentieth of this total applied as maintenance of our fleet will provide a choice bit of work for many American industrial plants. And it will be broadly distributed too, because in the making of these ships twenty-four major trades are represented.

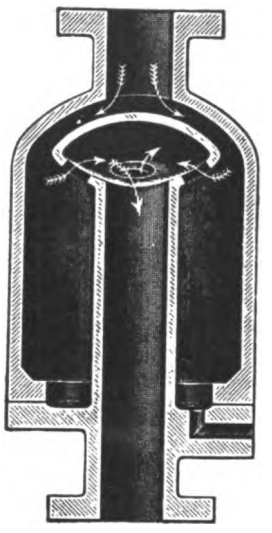
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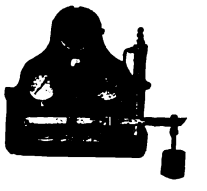
THERE are many so-called "coal-savers" which are theoretically good. But the practical test lies in *saving more coal-dollars than they cost*. This is the test that determines their worth; and it is the test which---in many years of service---puts the stamp of final approval on the three coal-savers shown here.

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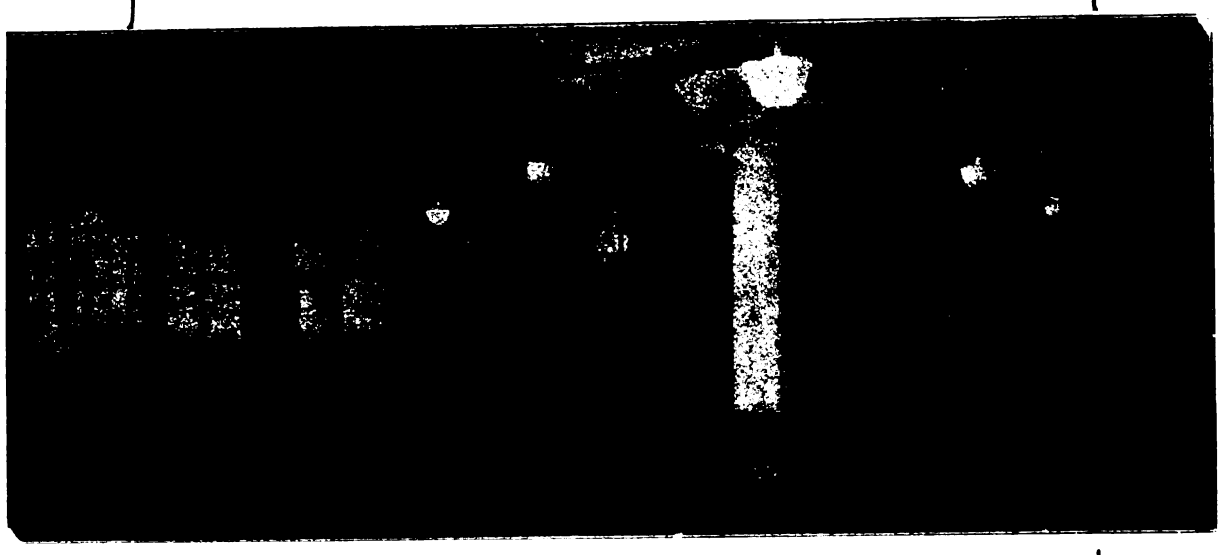
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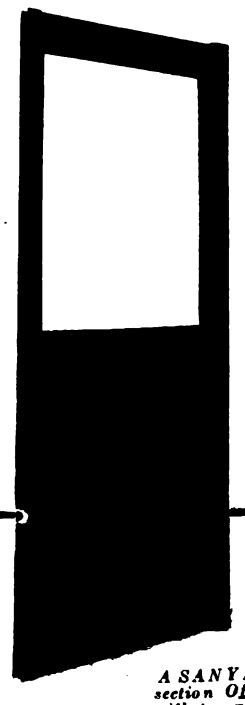
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A SANYMETAL Unit section Office Partition with top panel open for glass. The batten is in place on one side only.

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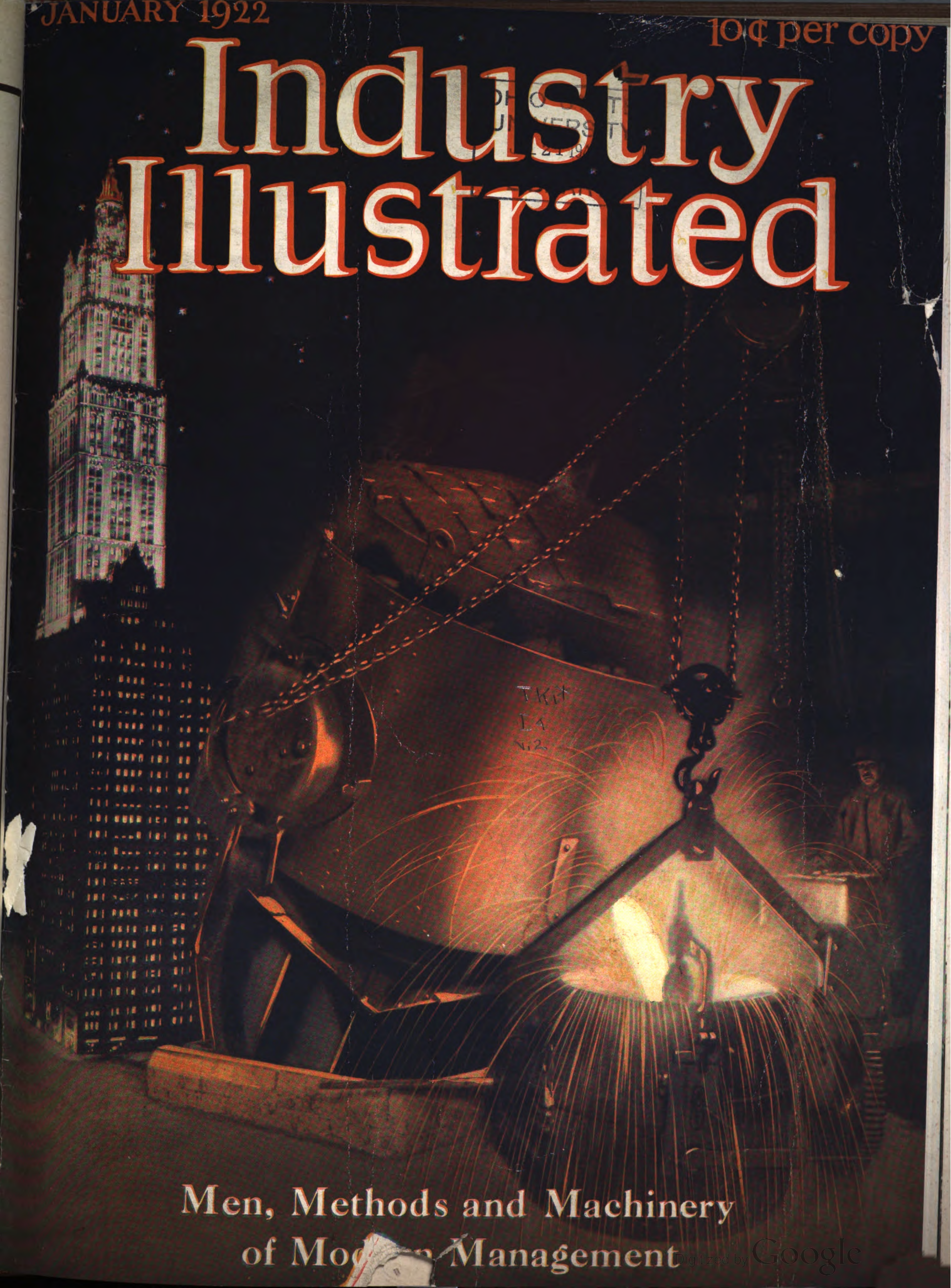
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JANUARY 1922

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Industry Illustrated



Men, Methods and Machinery
of Mo[illegible] Management

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Of Course "Trackless Train" Trailers Are Equipped with Hyatt Roller Bearings



The "Trackless Train", that effective method of plant transportation advocated by the Mercury Manufacturing Company, consists of a series of load carrying trailers pulled by the famous Mercury tractor.

To effectively carry their loads continuously and economically, these trailers are constructed of the best materials and have improved caster wheels, positive action couplers, and Hyatt roller bearings.

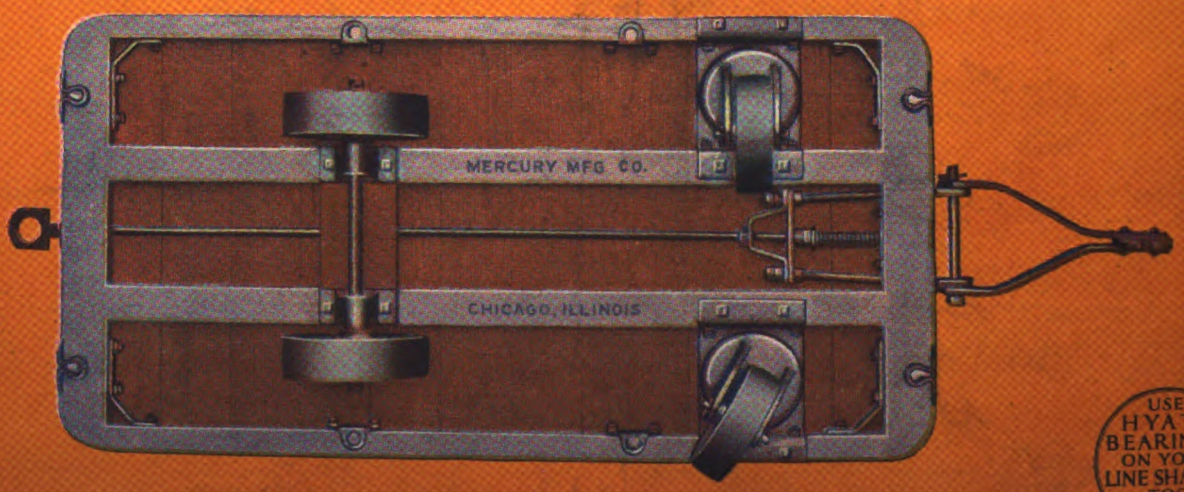
The use of Hyatt bearings on these Mercury trailers makes them easy running and capable of operating properly with three or four applications of lubricant a year, and the durability of the bearings insures these advantages during the life of the trailers.

When Hyatt bearing trailers are used, each tractor can handle 20 per cent more trailers, and storage battery strains are eliminated, together with the necessity of noon-day boosting. For economical, dependable haulage equipment, specify Hyatt roller bearings.

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BULLETIN 125

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INDUSTRY ILLUSTRATED

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JOHN R. DUNLAP, *Chairman of the Board*

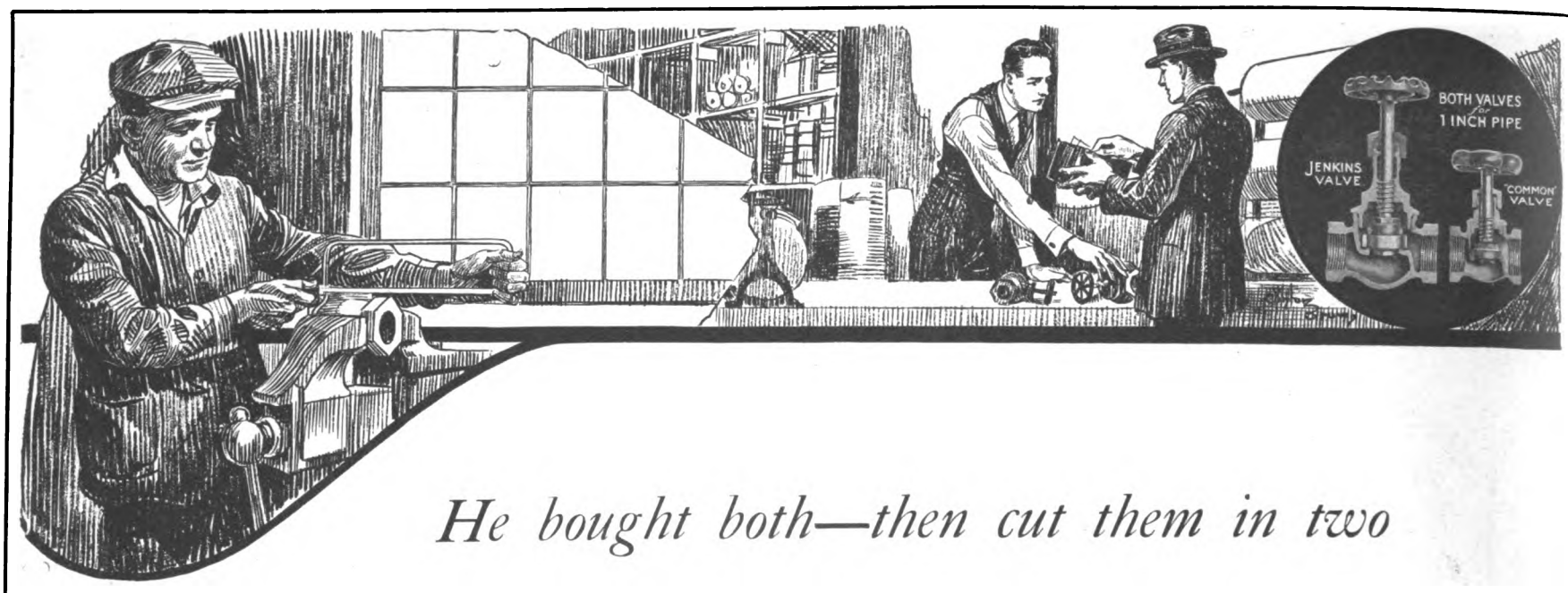
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He bought both—then cut them in two

Our client, told us that, size for size, his valves are larger and heavier than "common" valves; that the thickness of shell in the bodies, while proportioned to be heaviest at points of greatest strain is greater at any point than the heaviest part of a "common" valve.

DID our client's claims satisfy our Account Executive? Not for a moment. He himself had to be "sold" on the merit of the product. He went to an independent supply house and got from stock a "client's" valve and a "common" valve of the same rated sizes. He took them to a shop, and had both sawed in two and proved to his own satisfaction the accuracy of our client's claims—then and there he obtained a new idea for the use of the client's salesmen and for his own "copy."

And this was not an exceptional case. Our man was merely following the standard practice of our company. We make an intensive study of the products and market of each client—a thorough study—not a superficial one. Only a week or two ago the publisher of a well known technical paper sent an inquirer to us about a certain product, saying, "they know more about that subject than anyone I'm acquainted with." We handle the advertising of one of the leading manufacturers of the product in question.

This intimate knowledge of each client's business and product is made possible through the unique "unit system" upon which our organization is built. It enables us to combine, to the benefit of our clients, the advantages of a "personal service" agency with those of a fully rounded advertising agency. It enables us to place a client's advertising under the direction of a man whose department is already handling related but non-competing lines.

All of our Account Executives are stockholders and officials in the Company. They have an interest in the Company and its welfare. They don't drift and don't want to. There is no shifting accounts from one man to another. Our clients have never been under the necessity of changing from our agency to another because the man familiar with their business changed employers.

Our organization, offices and equipment are planned to meet the advertising needs of manufacturers—planned by men who know just what those needs are. A most analytical investigation of our methods and our work is cordially welcomed.

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Industry Illustrated

John H. Van Deventer, Editor

W. Thomson Lees, Associate

Reginald Gordon, Associate

EDITORIAL

The Divine Cubic Inch

THERE are those among us who pride ourselves upon our "practicability," and who greet departure from precedent as "mere ideas." We forget the fact that every one of the practical realities with which we deal today were mere ideas—not long ago.

Twenty years ago, High Speed Steel was a mere idea in the mind of Taylor. Since its birth it has revolutionized machine shop practice, and today the world's metal working plants base their output upon its performance.

Thirty-five years ago the gasolene motor car was a new idea in the mind of Levassor. That idea relegated the horse, then the chief motive power of highway transport, to the scrap heap for long hauls. Today more than two million motor cars are produced per year in the United States alone.

Fifty years ago, the typewriter was a mere idea in the mind of Sholes. Today, handwriting in business and industry is the exception and typewriting is the rule.

One hundred and fifteen years ago, steam transportation on land and sea were mere ideas in the minds of Stephenson and Fulton. Today, not only the progress of civilization but even the very existence of thousands of millions is dependent upon our steamships and railways.

Here are five ideas which, within twice the span of a normal human life, were born, have matured into practical realities, and have revolutionized all industry.

Ideas are the most powerful, the most enduring, the most vital and effective realities with which we have to do.

Where do they come from?

Each one of these five world-changing ideas came from the "cerebral cortex" of a human brain.

All of the railway systems of the world originated in one cubic inch of brain tissue—the cerebral cortex of Stephenson. What a miracle of creative power! And yet some say that the age of miracles is past.

Every normal human being is born with a cerebral cortex exactly similar to that of Taylor, Levassor, Sholes, Stephenson or Fulton, and with equal promise—properly cared for and rightly developed—to change the world.

Creative mind-power is the quality that distinguishes man from beast, and men from machinery. Yet many are content to trade this splendid power for a silly fear of novelty and change.

Some of us nullify the creative power of this divine cubic inch through a blind adherence to precedent and the beaten path.

Some of us stultify its miracle working possibilities with the narcotics of greed, anger and appetite.

But most frequently of all, we let the fear of ridicule freeze its budding fruit—the fear of those of our fellows who welcome the adult *reality* but scorn the infant *idea*.

Taylor, Levassor, Sholes, Stephenson and Fulton were men of heroic courage and indomitable persistence; men who were equally able to shut their minds to ridicule and to open them to new ideas.

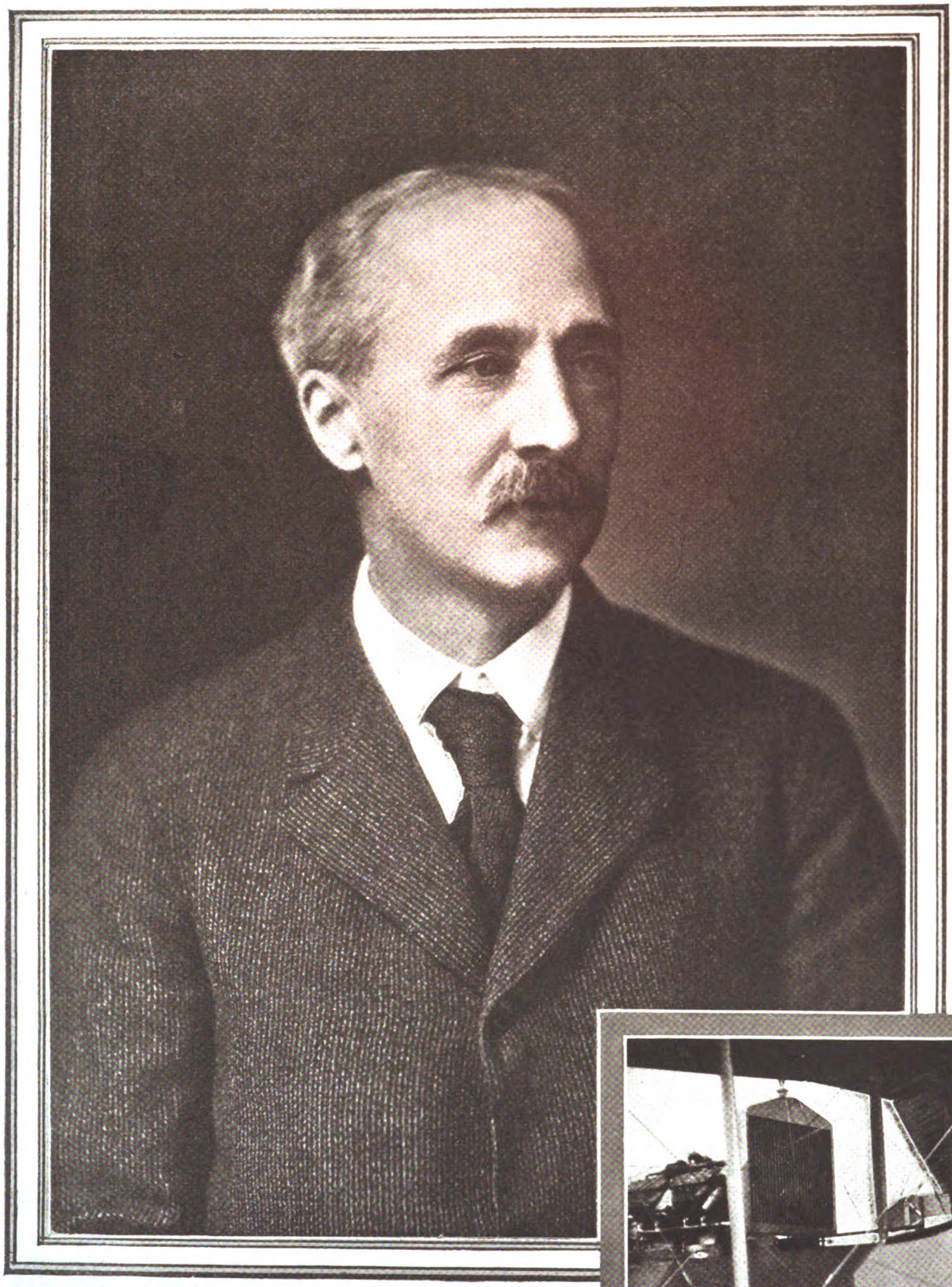
Here's to the divine cubic inch and the stiff upper lip—a combination that has power to raise mankind to the plane of peace, progress and prosperity!

Additional copies of this Editorial will be furnished on request

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The Dean of Carbon Black

An Interview With Godfrey L. Cabot



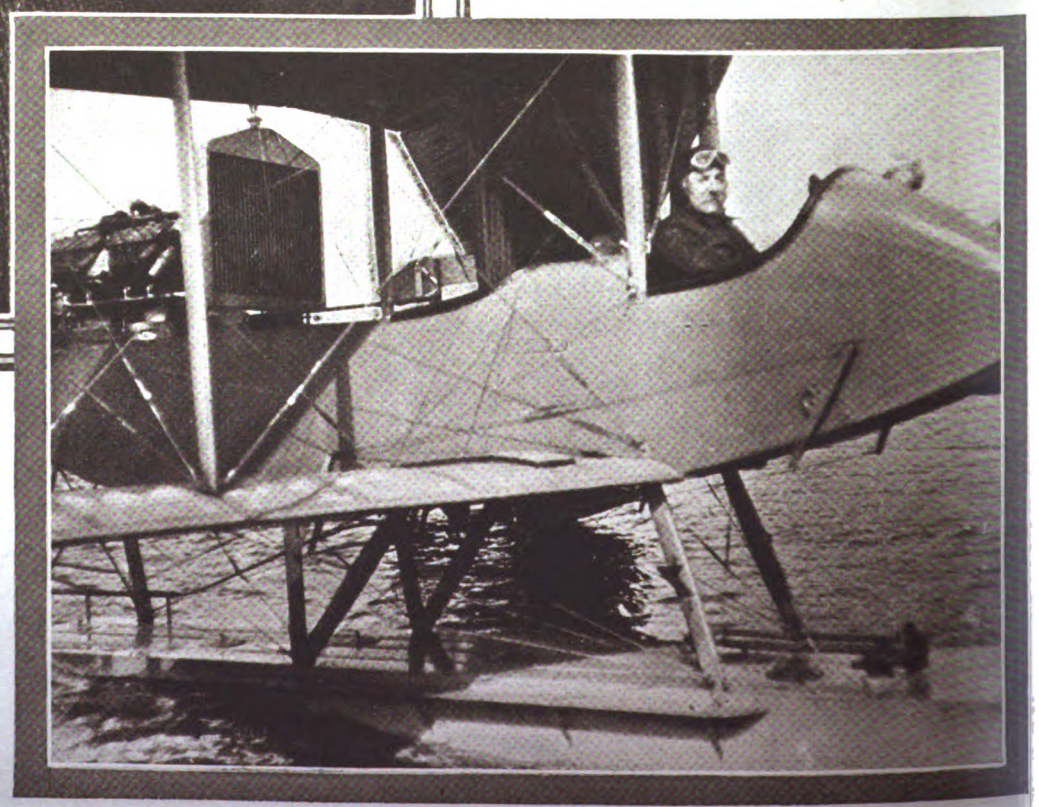
Godfrey L. Cabot, "the dean of carbon black," has been largely instrumental in giving us carbon paper, black printers' ink and long wearing auto tires. Aside from owning the largest works of their kind in the world at Grantsville, W. Va., he is the owner of a half dozen or more carbon black factories and works in Pennsylvania, West Virginia, and Louisiana. Not content with all this activity, he took up naval aviation just before the war. He was appointed a Lieutenant in charge of the Marblehead Aviation Camp, later flying as a pilot and patrolling Boston Harbor on the lookout for enemy submarines. He developed the picking up of burdens in full flight during 1917 and 1918.

WHAT do *you* know about carbon black?

Most of us come in intimate contact with it every day. It stares us in the face as we read our newspapers; our typists, secretaries and stenographers cannot get along without it, and when we take the motor car out for a spin, the tire performance may largely depend upon the same mysterious carbon black. Carbon paper for duplicating and printers' ink, both, get their blackness and reproducing qualities from this product. But its principal though less familiar use is as a toughener and strengthener of rubber. Hereafter when you use any of these things perhaps you will think of the gentleman to whom we are about to introduce you — Godfrey L. Cabot, the "Dean of Carbon Black."

Mr. Cabot's training has been unusually appropriate and complete for the task of establishing an industry. His scholastic training included the Massachusetts Institute of Technology, Harvard University, the Zurich Polytechnicum and the University of Switzerland. His practical training has been equally comprehen-

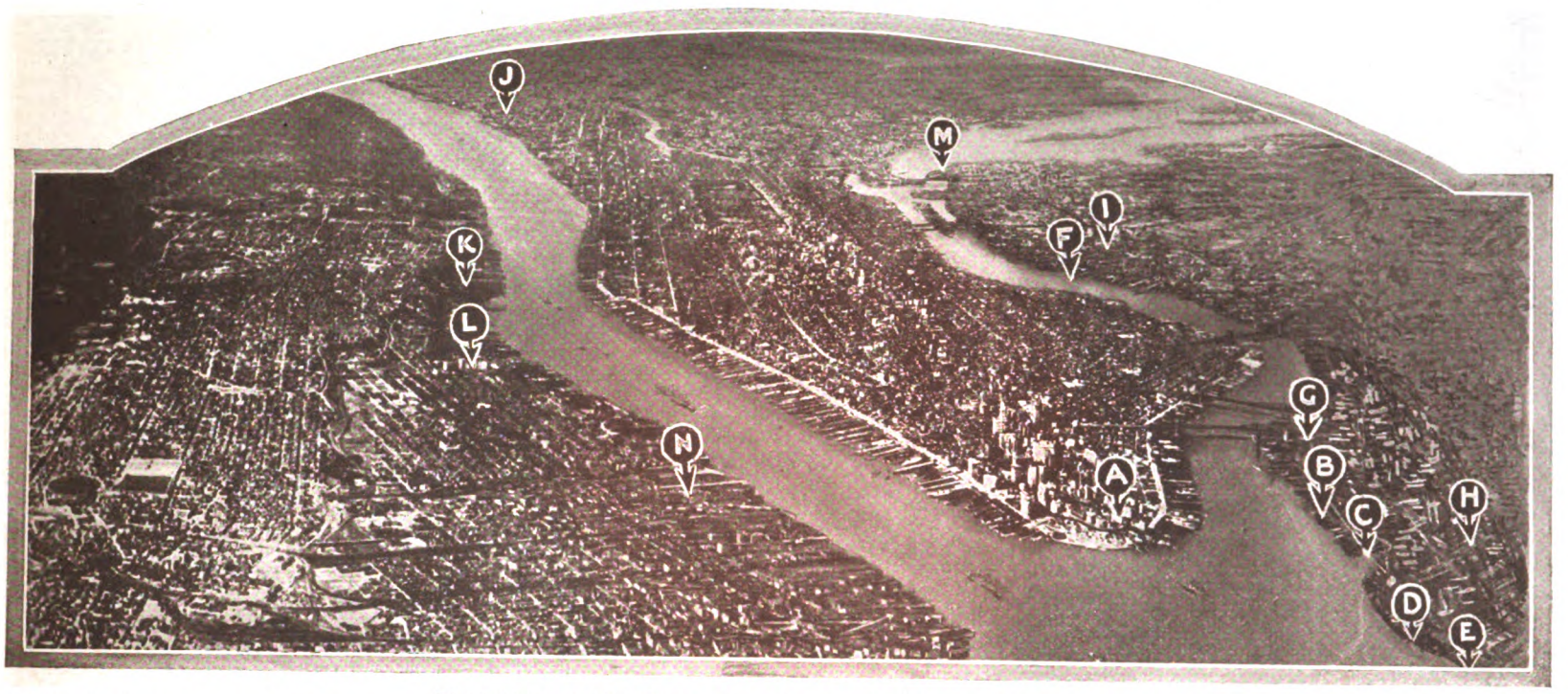
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Looking Down on $3,000,000,000 Worth of Industry

Bird's-Eye Views of the Metropolitan District, where One-Twelfth the Country's Output is Manufactured.



The letters on the above map refer to districts mentioned in the accompanying text, and also to the individual photographs on succeeding pages. In the City of Greater New York alone, over Three Billion Dollars is invested in industry, and this district in the last census year (1919) produced one-twelfth of the total manufactures for the United States.

THE airplane now affords the opportunity of visualizing the greatness of the Port of New York within an hour's time. Here are reproduced only a few of the high spots of which the photographer has made a record.

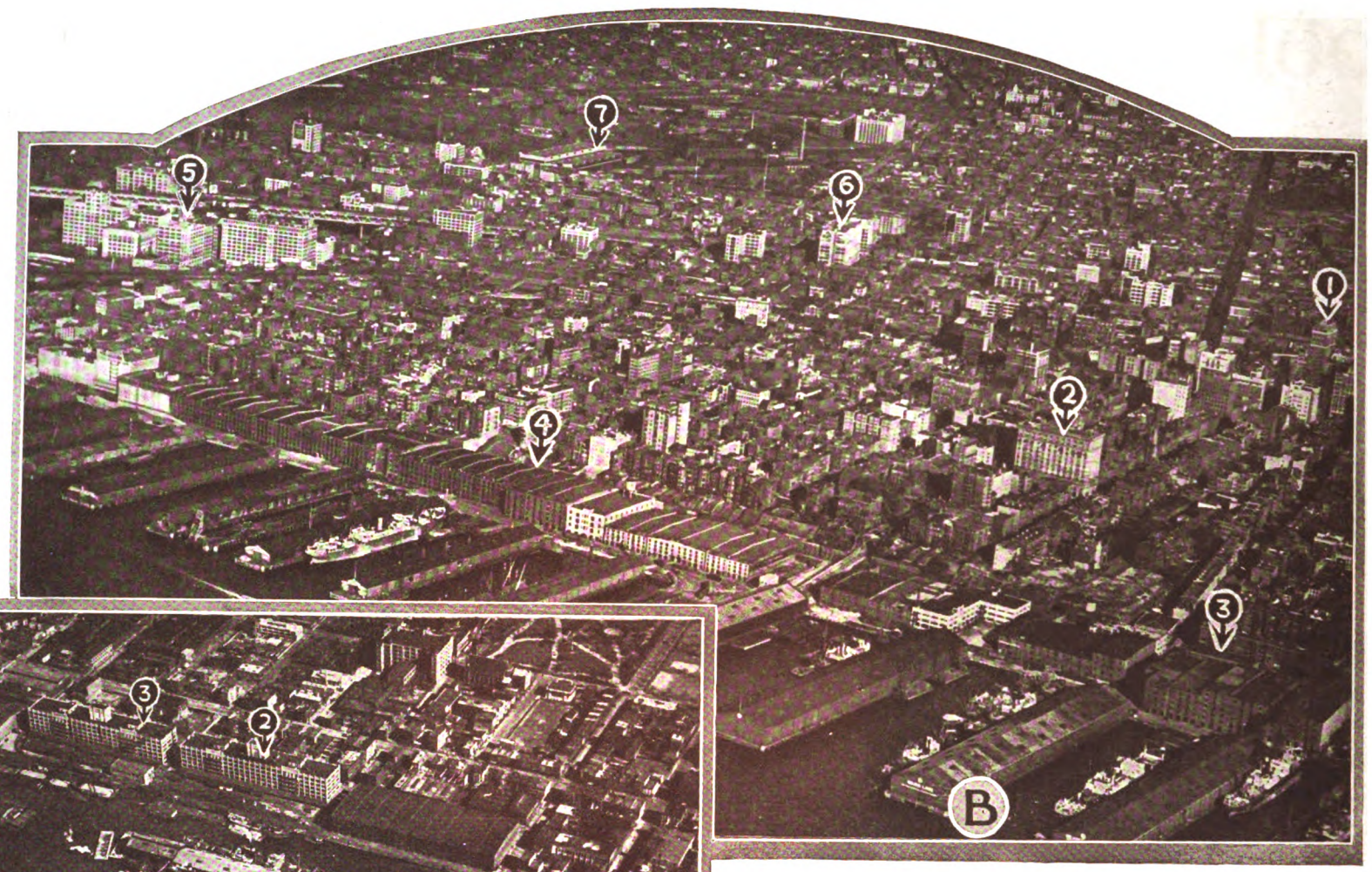
Taking off in a seaplane at the Battery (A) in Manhattan, our first impression is of the tall buildings which house the executive offices of America's greatest industries. A turn to the South (B) and Brooklyn Heights, with its old residence center and many office buildings, comes into view. Traveling Southeast (C) we pass the New York Dock Company's plant, on by Gowanus Bay (D) to the home of hundreds of manufacturers, (E) Bush Terminal. Here we decide to forego Coney Island and swing directly to the East, across South Brooklyn to Jamaica Bay (H) and the Ocean. With a sharp dip (G) we turn back Northwest, pick up the headwaters of Newtown Creek (F) and follow it to its junction with the East River. North up the river, we see on our right the mass of masonry (I) which is Queensboro with its ever growing complement of productive factories. Over Hell Gate Bridge (M) (an engineering masterpiece), the Bronx, with its industrial possibilities largely undeveloped as yet, appears as we follow the Harlem River to Spuyten Duyvil (J) and the Hudson. Southward along the Hudson we can see, backed by the Palisades, the remarkable plant (K) of the Corn Products Refining Company, at Weehawken, then Hoboken (L) with its docks and piers, and finally Jersey City (N) with the Eastern Terminals of the big railroads. From here we make the short "hop" back to the Battery.

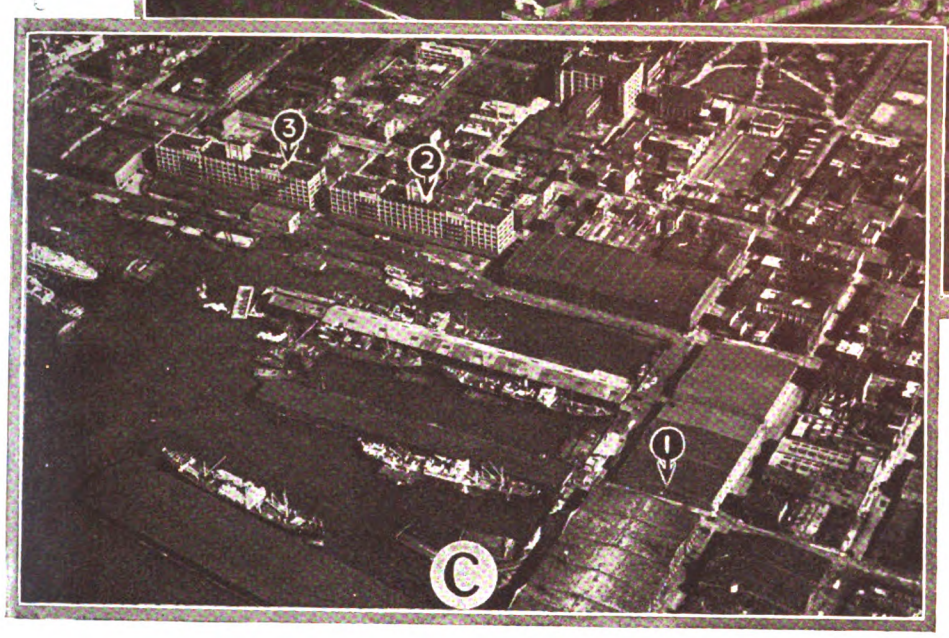


THE LOWER TIP OF MANHATTAN ISLAND

Among the many hives of industry in this aggregation of executive offices are (1) The Whitehall Building; (2) The Cunard Steamship Building; (3) Adams Express Building; (4) Bankers' Trust Company; (5) The New Equitable Building; (6) The Woolworth Building, highest office building in the world.

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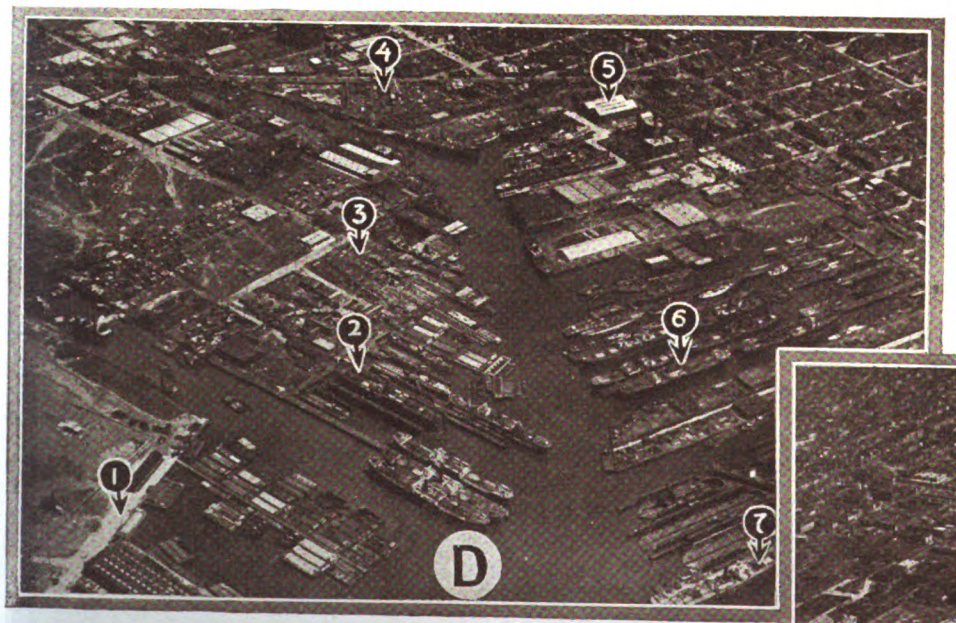


DOWNTOWN BROOKLYN FROM THE UPPER BAY

Taking in the residential section known as "The Heights." Outstanding points of interest are (1) The Brooklyn Chamber of Commerce Building; (2) Hotel Bossert; (3) The Ward Steamship Line Docks; (4) The extensive property of the New York Dock Company; (5) The Robert Gair Company buildings (see illustration G for a nearer view); (6) Sperry Gyroscope Company; (7) The Brooklyn Navy Yard.

NEW YORK DOCK COMPANY TERMINAL

Illustration (C) at the left, shows at (1) the property leased to the Barber Steamship Lines; (2) leased to the Franklin Baker Company; (3) leased to the American Can Company.



UPPER GOWANUS BAY

At the left (D) are shown the chief dry docks and shipyards of New York Harbor, concentrated about Gowanus Bay. (1) shows the New York State Barge Canal Terminal; (2) Part of the Todd Shipyards Corporation; (3) Stacks of dye-wood purchased at the outbreak of the war, and still unused; (4) Coastwise Lumber and Supply Company; (5) Alderton Shipyards; (6) Tebo Yacht Basin; (7) James Shewan & Sons, Shipbuilders.



BUSH TERMINAL

At the right (E) is South Brooklyn's Industrial Center, with (1) the Supply Depot of the United States Navy and (4) the barn and yard of the Brooklyn Rapid Transit Company. The rest of this property goes to make up Bush Terminal. The pier (3) is the longest single pier in the world.

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THE MOUTH OF NEWTOWN CREEK

Above (F) is where Newtown Creek joins the East River. Although only four miles long and 125 feet wide, with an 18 foot deep channel, Newtown Creek carries over six million tons of freight a year. At (1) is the Hudson River; (2) Queensboro Bridge, which had to have part of its structure removed in order to strengthen it, after construction was begun; (3) Atlantic Macaroni Company, world's largest makers of noodles; (4) National Sugar Refining Company; (5) Long Island R. R. Freight Terminal and Yards; (6) Newtown Creek; (7) Newtown Creek Realty Company warehouses; (8) New York State Barge Canal Freight Terminal.

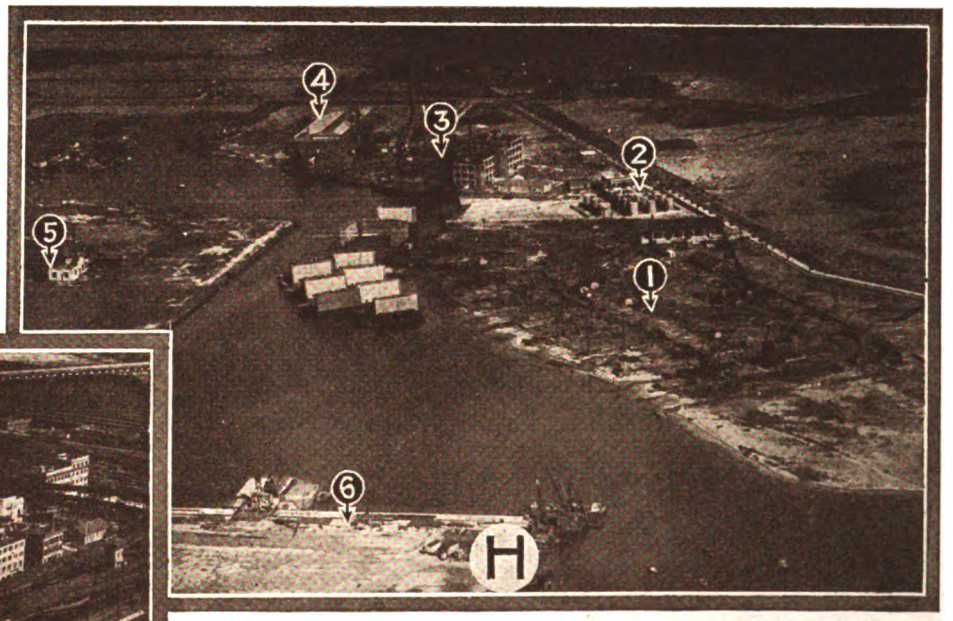


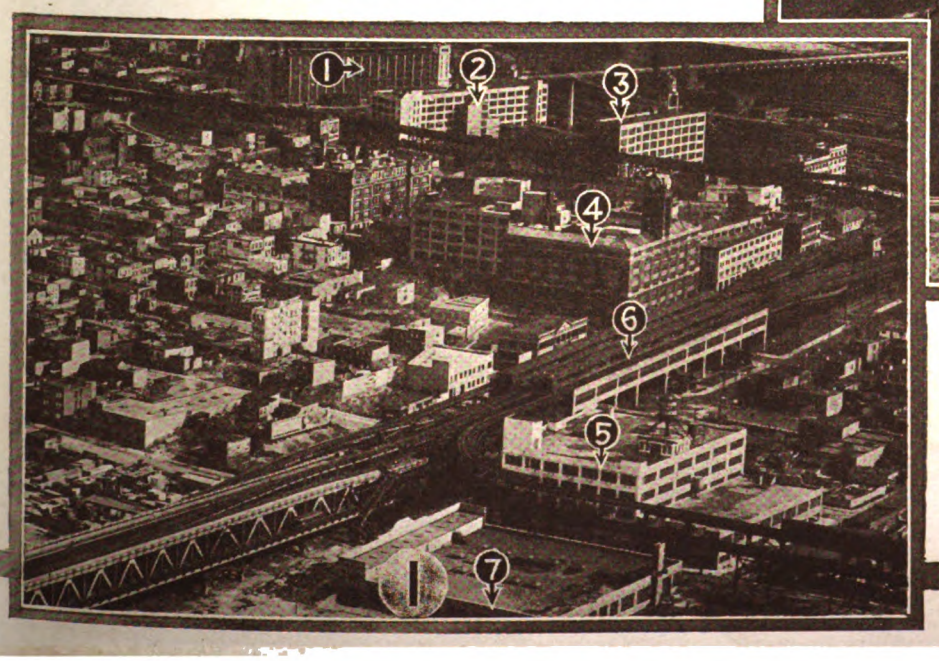
BROOKLYN, BETWEEN THE BRIDGES

At the right (G) between the Manhattan Bridge (1) and the Brooklyn Bridge (2) are the enormous plants of (3) Arbuckle Brothers; (4) Charles William Stores; (5) Sweeney Manufacturing Company; (6) Robert Gair Company; and in the upper corner a part of one of the E. W. Bliss Company buildings.

MILL BASIN, JAMAICA BAY

At the right (H) is the new Mill Basin development at Jamaica Bay, showing (1) Atlantic Gulf & Refining Company shipyard; (2) Gulf Refining Company; (3) National Lead Company; (4) The William Harvey Corporation; (5) Republic Bag Company; (6) Atlantic Gulf and Pacific Company's extension of Flatbush Avenue, Brooklyn.

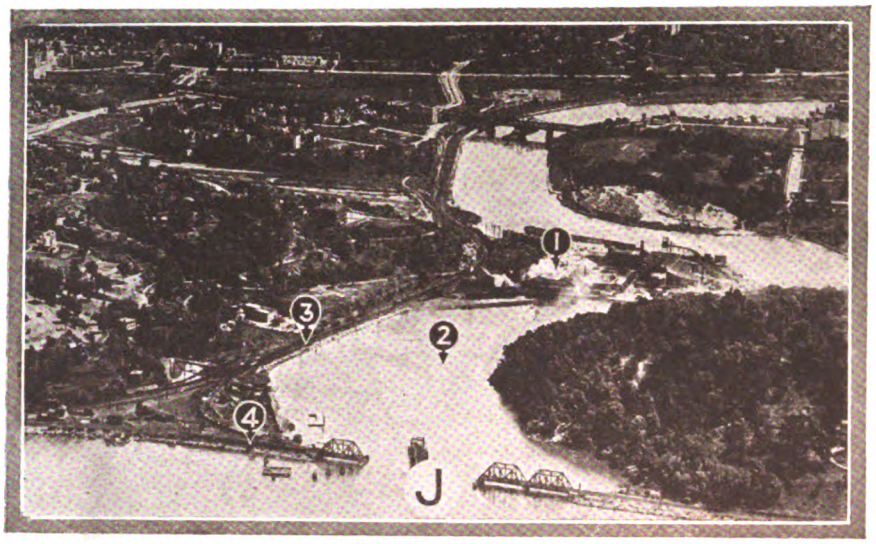




THE HEART OF QUEENS BOROUGH

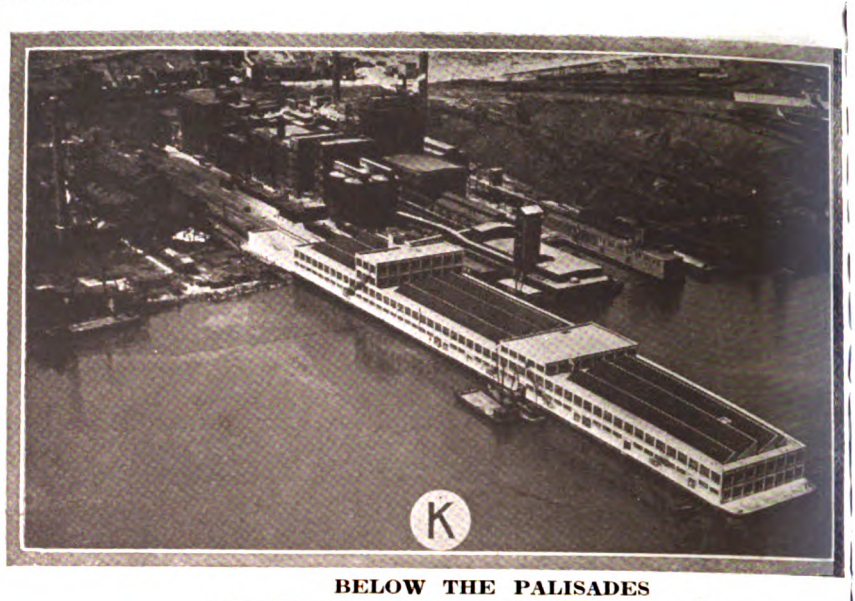
At the left (I) is Queens Plaza, with (1) Eastern factory of Durant Motors Company; (2) Tiffin Products Company, the detached kitchen of several of New York's largest hotels; (3) National Casket Company; (4) Brewster, Inc., builder of custom automobile bodies; (5) Automobile factory of Standard Steel Car Company; (6) Queens Plaza station of B. R. T. and I. R. T. subways; (7) Long Island Assembly Plant of the Ford Motor Company.

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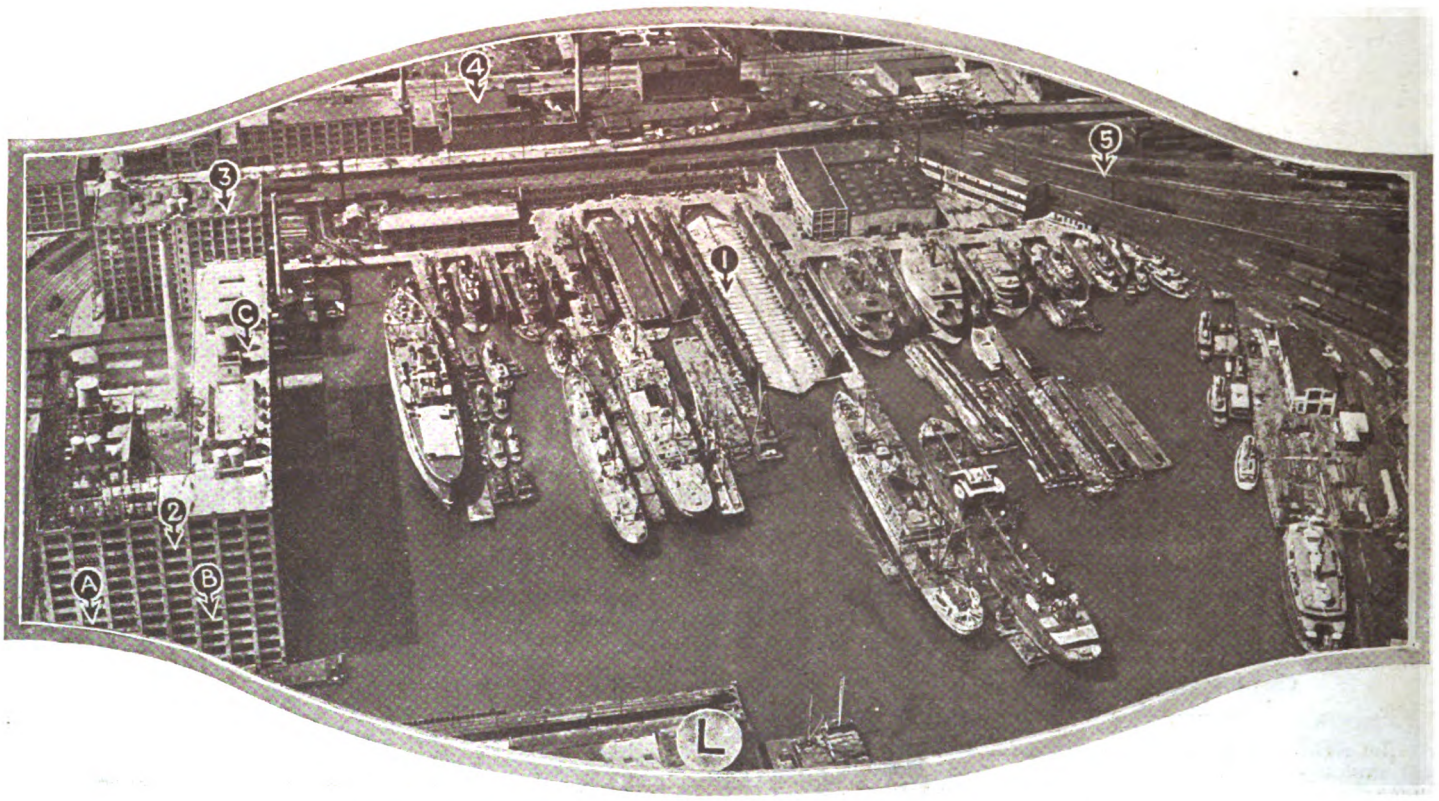
SPUYTEN DUYVIL

The northernmost tip of Manhattan Island, with (1) Steel Mills of the Isaac G. Johnson Company; (2) The Harlem River; (3) New York Central R. R. tracks to Grand Central Station; (4) New York Central R. R. tracks to West Side Freight Yards.



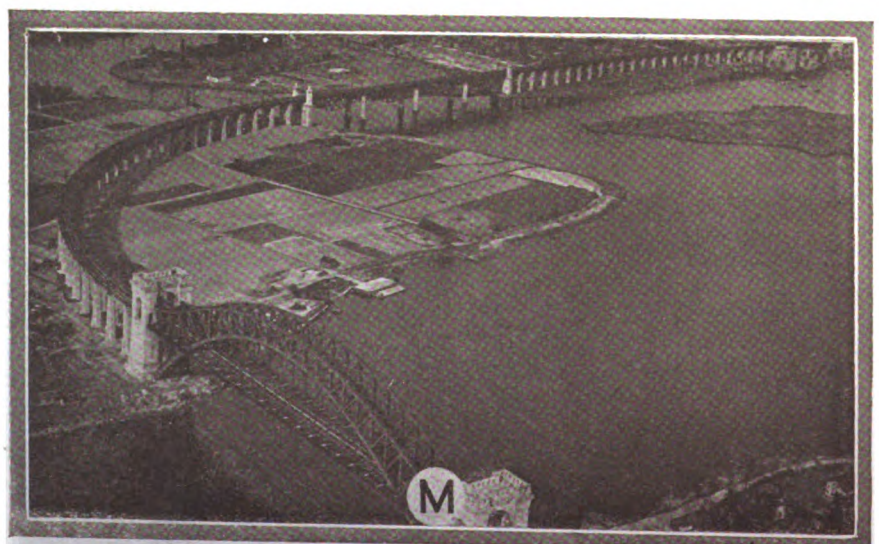
BELOW THE PALISADES

At Weehawken, N. J., the modern plant of the Corn Products Refining Company lies at the foot of the famous Palisades. Note the splendid shipping facilities both by rail and by water.



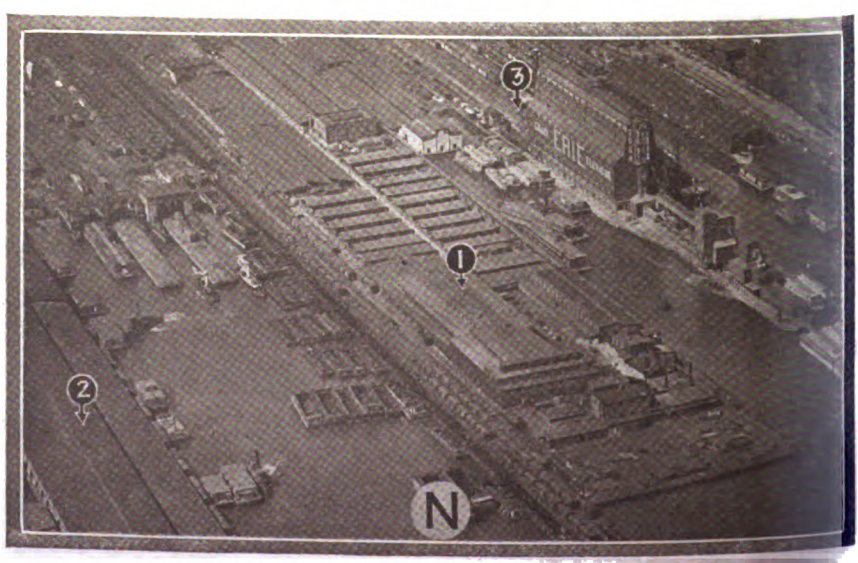
HOBOKEN

The war turned this section into a terminus for the transport service, but it is coming back to its former status rapidly. At (1) is an empty dry dock, ready for the S. S. "George Washington" at the Tietjen & Lang Dry Dock Company; (2) Hoboken Land Improvement Company building, housing (A) Thos. Lipton, Inc., (B) Jewel Tea Company, (C) Independent Warehouse Corporation; (3) The Bijur Motor Appliance Company; (4) Hudson Consumers Ice Company; (5) Erie R. R. classification yards.



HELL GATE BRIDGE

This bridge is the rail outlet for Brooklyn and Long Island freight destined for New England. On completion of the tunnels connecting Long Island and Staten Island—and in turn, New Jersey—much of the freight from the West will travel over this bridge.



JERSEY CITY STOCKYARDS

Directly across the Hudson River from lower Manhattan lies Jersey City, with (1) the largest slaughter house for sheep and hogs in the Metropolitan District; (2) One of the Pennsylvania R. R. piers; (3) Erie Grain Elevator and freight yards.

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"Our Daily Bread"

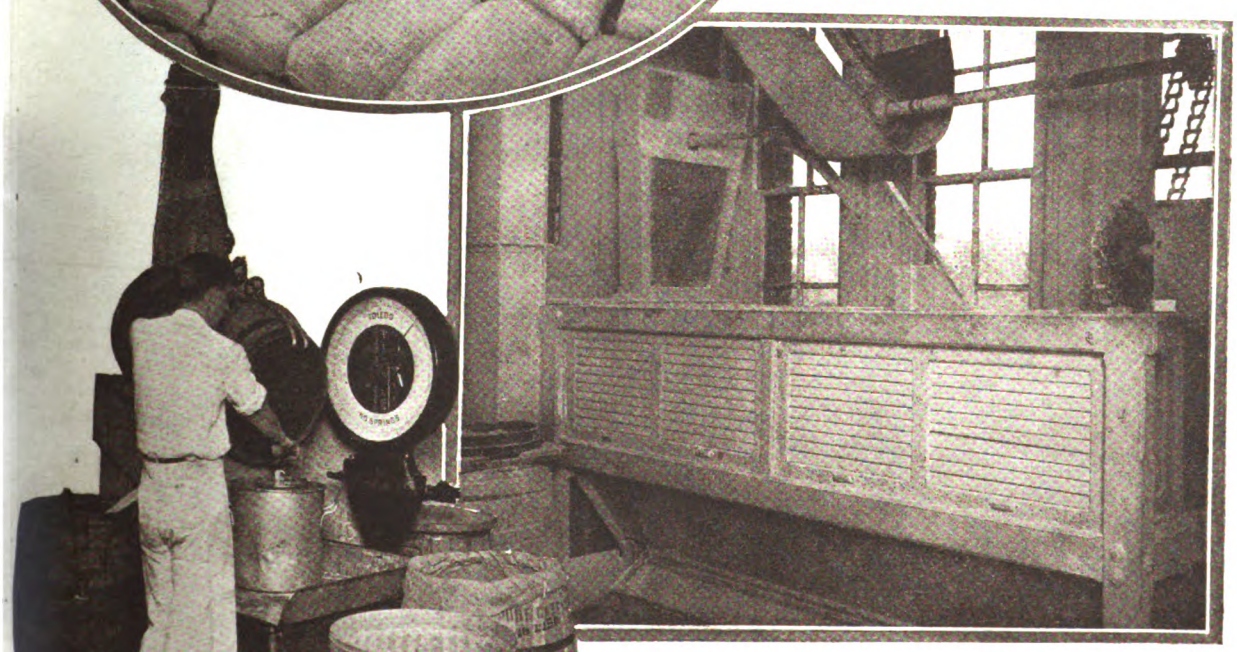
Scientific Methods and Machines that Produce 70,000 Loaves a Day

By W. Thomson Lees



This truck is kept fairly busy hauling flour from the freight terminal. At the left, in the oval, is shown part of the flour-storage room at the baking plant. Each variety of flour is marked, and a record is kept of results.

Below—the flour is sifted and screened by machine, and is conveyed to bins overhead, above the dough mixers. (See illustration at the top of the next page.)



At the left—adding the milk to the other ingredients (sugar, salt, lard). Each can contains the proper amount for a "batch" of dough. These cans are conveyed by elevator to the mixing room, the flour being added there.

EVEN at the tender age of seven, we manifested that prying curiosity about other people's business, which is a mark of the budding reporter and, being in the kitchen (where boys of seven don't belong) we asked the large Lady of Color who presided there, "How do you make that bread?"

"Why, you takes a bowl o' flour, an' some sugar an' lard, and you mixes 'em with just enough milk an 'a couple of pinches of salt. An' you puts in a yeast-cake to make it rise, an' mix 'em up good. Let de dough stan' overnight till it's riz, and put 'em in the oven till dey's baked."

This was such a simple formula that it satisfied us, for the time being. Only for the time being, however. Later on, when we noticed the thousands of loaves of bread delivered daily to retailers all over the city, it didn't seem possible that this formula could be the basis of an industry grown to such proportions.

To satisfy that prying curiosity, we made a trip up to the wild fastnesses of the Bronx, where the General Baking Company has its newest and most up-to-date bread-baking plant. There were a

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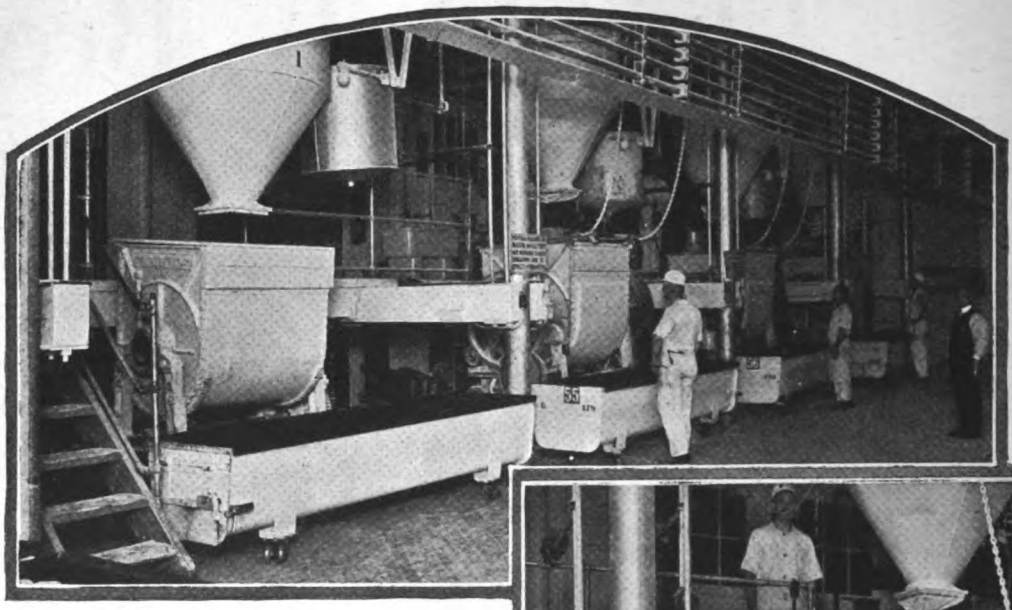
number of surprises there; among them, the fact that they *do* use the same ingredients and the same formula that our lady of color gave us! Only, they have found out exactly how much of each ingredient is necessary, and just how much heat and humidity, and so on, will produce not only the *best* bread—but will do it uniformly, day after day.

First of all, there is no appearance of haste anywhere in the plant. Second, and most important, there most decidedly is an all-pervading impression of cleanliness. The ingredients that make up the dough are not touched by hands in the process of mixing. Later on in the process, where handling is necessary, the workers wear clean white gloves, to avoid the possibility of contamination.

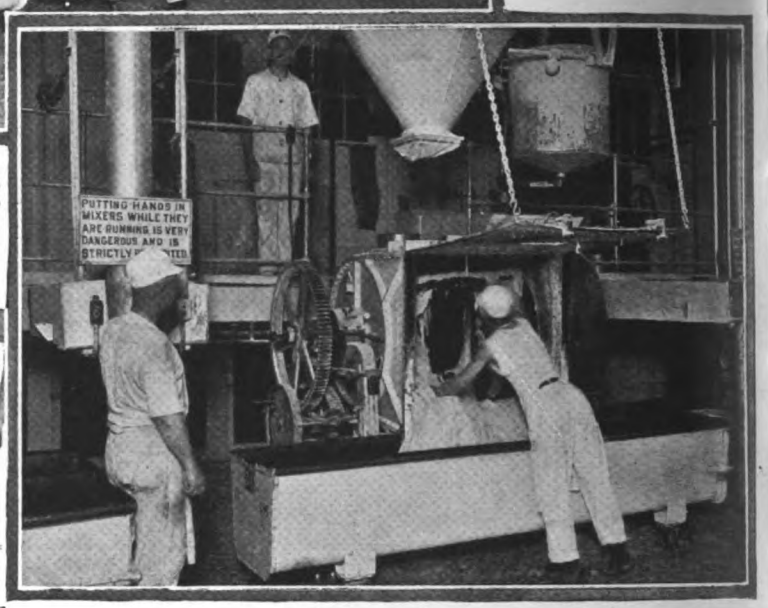
The lard, salt, milk and sugar are carefully weighed and put in large cans, each can containing the proper amount of these ingredients for one "batch" of dough. These cans go, by elevator, to the top floor where they are received at the "upper level" of the mixing room. This upper level is a mezzanine floor built at the height of the tops of the dough mixers.

Meanwhile, the flour, which is received in bags, passes through a mechanical sifter, and is elevated to bins above the mixers; being brought to the latter by means of the funnel-shaped spouts shown on the photos.

A measured quantity of flour is admitted to the mixing machine, together with the contents of one of the cans. Then the proper amount of

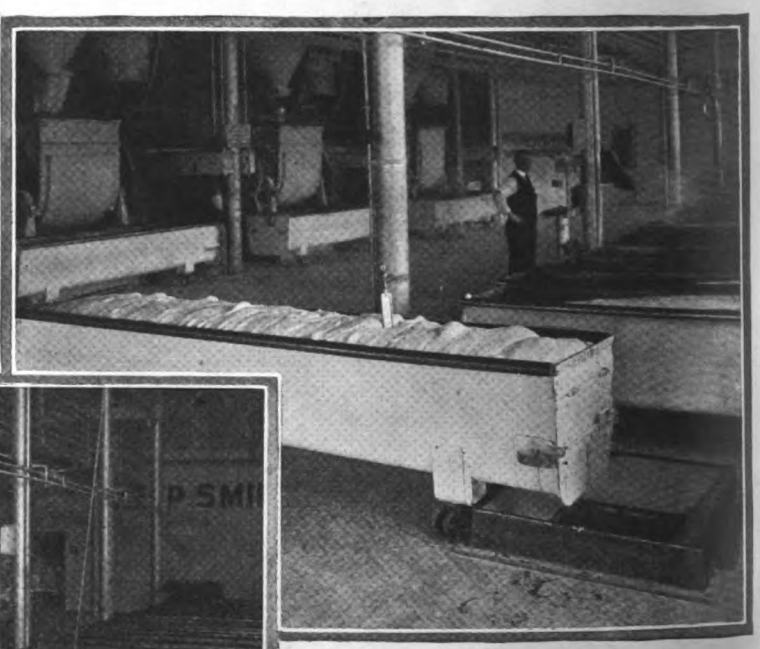


A row of mixing machines, with troughs in place, ready to receive the dough. Note the spout above each mixer, through which flour is delivered in measured quantity.

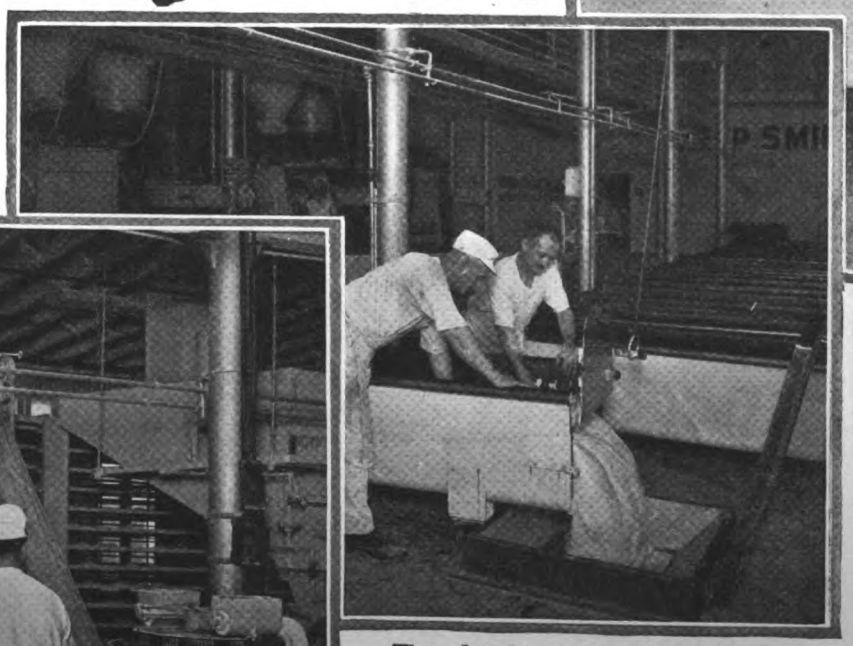




Removing the dough to trough, after mixing. At the left is shown a "close-up" of the same operation.

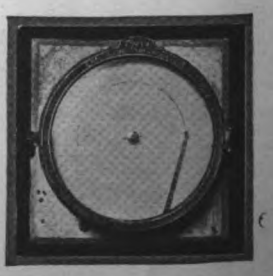


A finished batch of dough (note the testing thermometer) ready to be dumped down the chute.





The dough passes down the chute to a machine on the floor below. Here it is cut into size (six at a time) for individual loaves. The machine at the operator's right, rolls these loaves to shape, sprinkles with flour, and delivers them onto moving belt at the rear.



Recording thermometer which "keeps tabs" on the temperature in the mixing room.

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It takes the loaves eleven minutes to travel from top to bottom of this moving belt. They then drop through another chute, to the baking floor. (See illustration at the right.)



Coming from the floor above, the loaves are here given their final shaping and are put into the baking pans, ready to go on the racks.



A rack full of filled pans being wheeled into the steam room. They remain here an hour, to raise the dough before going into the ovens.

yeast is added, and the mixer is sealed up. An electric motor turns the mixing blades at a steady speed for about fifteen minutes, to insure thorough mixing of the batch.

(Incidentally, each batch of dough weighs one thousand pounds. We caught ourselves wondering how many Ladies of Color would be required to give a steady fifteen-minute mixing to one thousand pounds of dough.)

At the end of the fifteen minutes, one of the men on the main mixing floor pushes a button, and the mixing machine is turned forward on its axis, the cover simultaneously opening, so that the batch of mixed dough is discharged into a trough. A few deft strokes of a knife loosen the last adhering shreds of dough, and the mixer returns to position for thorough cleaning before the next batch.

The troughs in which the dough is allowed to "set" resemble nothing so much as elongated bath tubs. We noticed, too, that whenever a bit of dough fell on the floor, it was *not* put in the trough, but was thrown away. And this in spite of the fact that the floor was so scrupulously clean that it put to shame many a kitchen table.

There were some forty-five of these troughs of dough under way at the particular moment. In an average day, this plant mixes from sixty to eighty batches of 1,000 lbs. each—thirty to forty tons of dough every day! And this is only one of a large number of plants supplying Greater New York's needs.

The dough remains in these troughs from five to six hours, being "cut over" at stated intervals to prevent uneven rising, and is tested from time to time by thermometer. Both

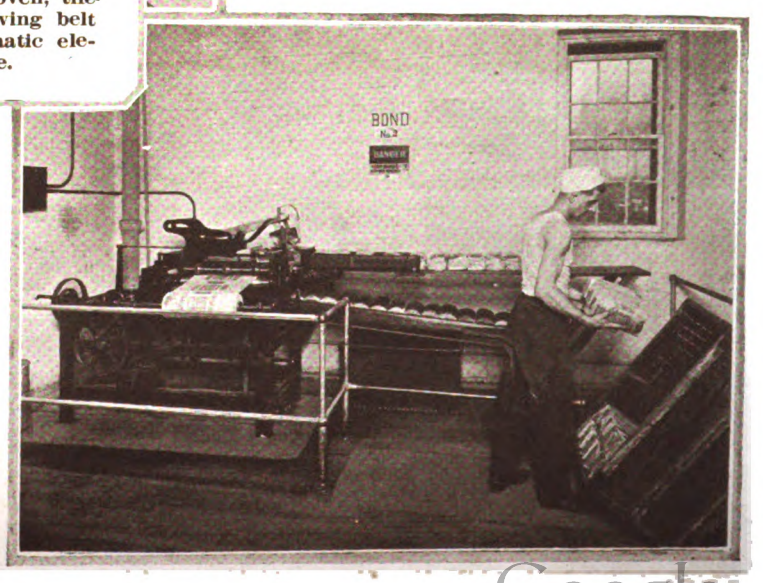
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As the pans are taken from the oven, the loaves are tapped out onto a moving belt which delivers them to an automatic elevator for the floor above.

Here the loaves are inspected and sorted before going on to the wrapping machine.





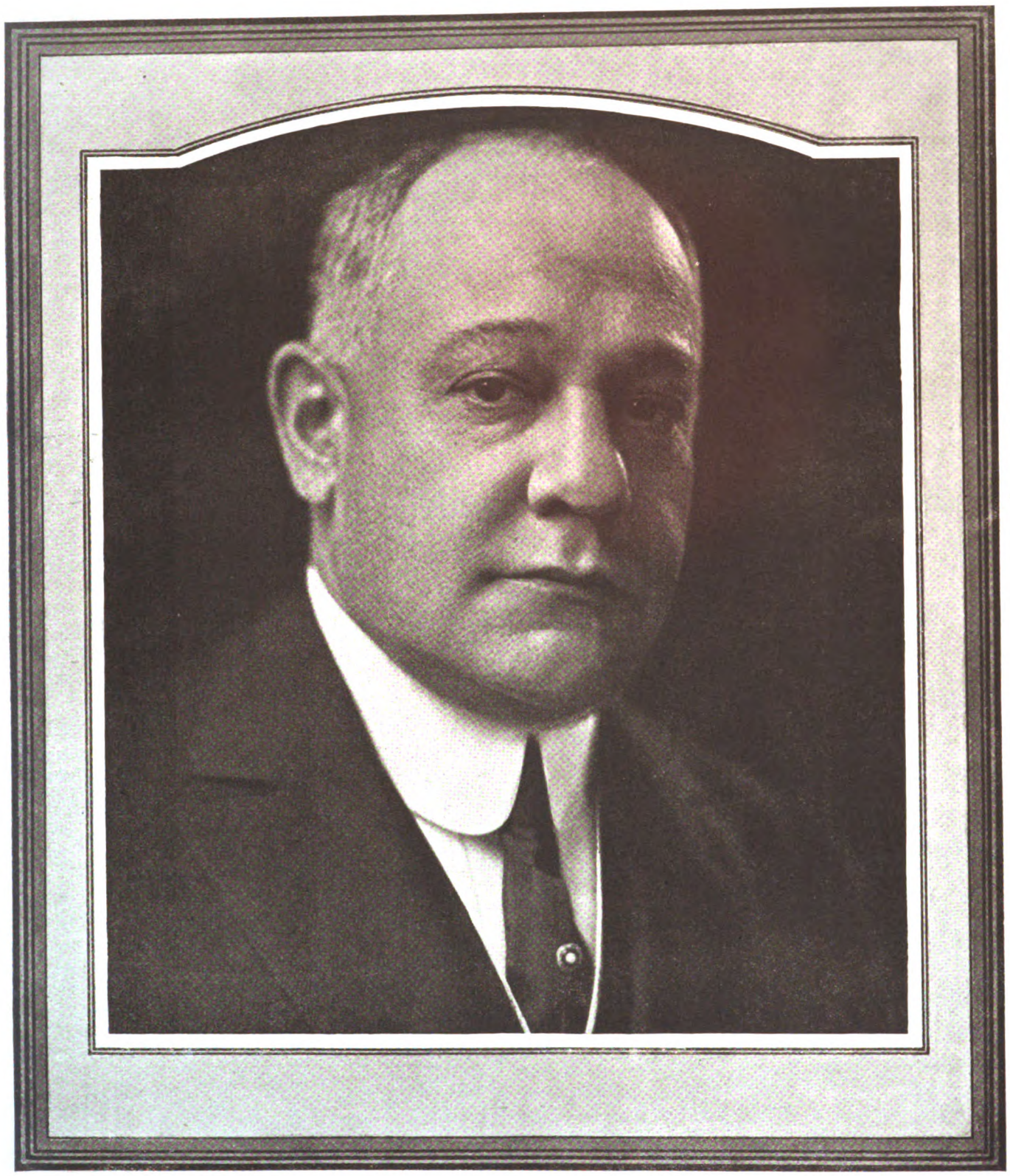
This machine wraps and seals each loaf with waxed paper, without being touched by hand during the process.

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Developing Our Natural Resources

The Public Utility as a National Asset

BY L. E. MYERS



LEWIS EDWARD MYERS was born in Pittsburgh in 1864, and graduated from Western University of Pennsylvania. He went with the Edison Electric Company of Pittsburgh in 1886; came to Chicago in 1891, as district manager for the Detroit Electric Works. In 1893, he organized The L. E. Myers Company, builders and operators of public utilities. Mr. Myers is president of twelve public utility companies and three industrial concerns, and treasurer of one and director in eight other utility companies, and three other industrial concerns.

Among the companies with which Mr. Myers is identified are the Central Illinois Utilities Company, Eastern Illinois Ice Company, Marquette County (Mich.) Electric Company, Southern Wisconsin Electric Company, Big Falls Power Company, Tri-State Construction and Equipment Company, Gogebic & Iron Counties Railway & Light Company, Ashland Power Company, Ironwood & Bessemer Railway & Light Company, and the Michigan Gas & Electric Company.

He was appointed in 1917, as chairman of the State Council of Defense for Cook County, Ill., and occupied this position for the entire period of the war. He is president of the Anti-Cruelty Society of Chicago, and his pet hobby is helping the under-privileged boy.

WE are living in a vital period. Never before within our memory has there been a time when so many problems fundamental to the progress of the country presented themselves to thinking men. These problems call for careful examination, clear thought and sober judgment. They are generally the result of the Great War and are, perhaps, the most momentous with which we have ever had to deal. So far as we in this country are concerned, there is none more important than the question as to how we can best develop our natural resources, because this subject has to do with the whole scheme of organized society. We want prosperity but it must be solid and enduring and must have as a basis the welfare of the country at large. Correct decisions and just action will mean much to the future of the country.

There are only two ways in which our natural resources can be developed—either by the Government itself or through the Public Utilities under government or state regulation, and the results of government ownership or management have been such as to pretty well prove that they are not to be preferred to private enterprise.

One of the reasons for the failure of government management is the disregard of responsibility to those for whom public employes are trustees, and the fact that they do not take seriously their public duties in any such measure as do those in like private employment.

The conduct of departmental government, no matter how good in theory, is only as businesslike and efficient as the personnel. The department is no better than the men who make it. There is nothing about any political appoint-

(*Continued on Page 50*)

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What is Normal Business?

An Interview on the Subject of Business Cycles

WITH COL. M. C. RORTY



COL. M. C. RORTY, who is the vice president of the Bell Telephone Securities Company, Inc., graduated from Cornell University in 1896, with the degrees of E. E. and M. E. Immediately afterward he started to absorb the practical fundamentals of his profession by working as ground hand, lineman and straw boss in the construction of the Niagara Falls transmission line.

In 1897, he joined the New York Telephone Company as installer's assistant, later becoming switchboard repair man and wire chief. In 1899, he entered the general offices of the Bell system, later becoming traffic engineer. In 1903, he was appointed superintendent of traffic at Pittsburgh of the Central District Telephone Company, later becoming general superintendent. In 1910, he came to New York to organize the commercial engineering department of the American Telephone & Telegraph Company, of which he became chief statistician.

Called to Washington in August, 1917, Colonel Rorty became chief of the Requirements Section of the Ordnance Department, and later was made chief of the Supplies Accounting Section of the General Staff. He accompanied Edward R. Stettinius to France in connection with the work of the Inter-allied Munitions Council.

ECONOMIC subjects have become such a matter of popular interest that even the "man on the street" knows in a general way that business moves in cycles. He knows that when statisticians make a map or rather present a picture of business variations covering a period of years, the portrait is a snaky curve that undulates up and down across an imaginary normal line, with peaks representing "prosperity" and valleys representing "hard times." The typical cycle, or one undulation of the snake, is shown in the accompanying diagram, which is the work of one of Colonel Rorty's associates.

Colonel Rorty, by the way, besides being Vice President of the Bell Telephone Securities Company, has until recently been one of the group of statisticians who visualize the industrial and economic future for the American Telephone and Telegraph Company, so that they can plan, in finance, construction and service, to keep pace with the normal growth of American industry. His predictions, like those of other modern business readers of the future, are not based on inspiration or prophecy but are projections made from a careful study of the past. And to make these studies and projections, a statistical organization has been built by Colonel Rorty and his associates, so extensive and effective that it would be difficult to find its equal anywhere.

Knowing that all wide awake American executives are vitally interested in the fluctuation of the business cycle—particularly that part of it that is ahead—we decided to go to headquarters and ask Colonel Rorty about it.

"Is there enough similarity," we asked, "between successive business cycles, so that we can judge of what is ahead

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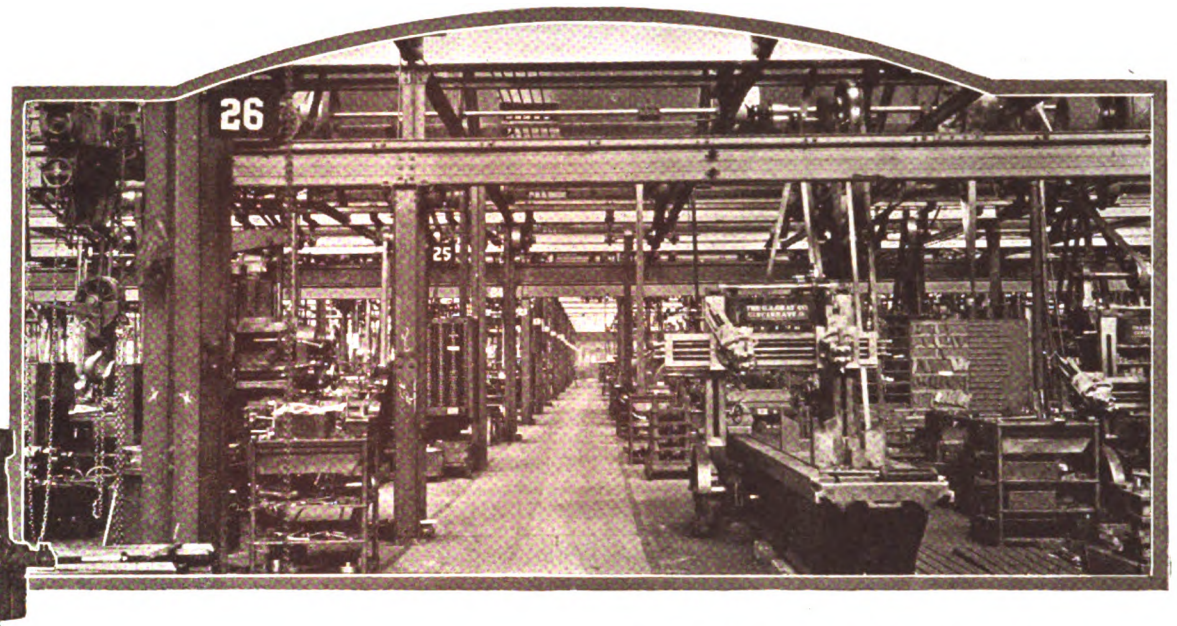
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Routing Work Through a Big Plant

Equipment and Methods Developed at the LeBlond Works

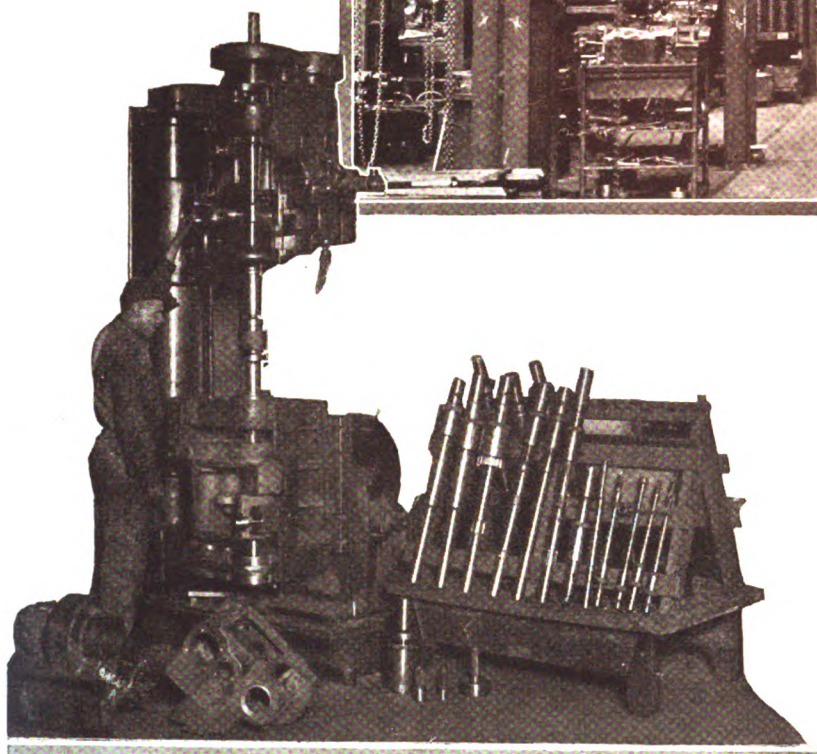
By Frank C. Lang

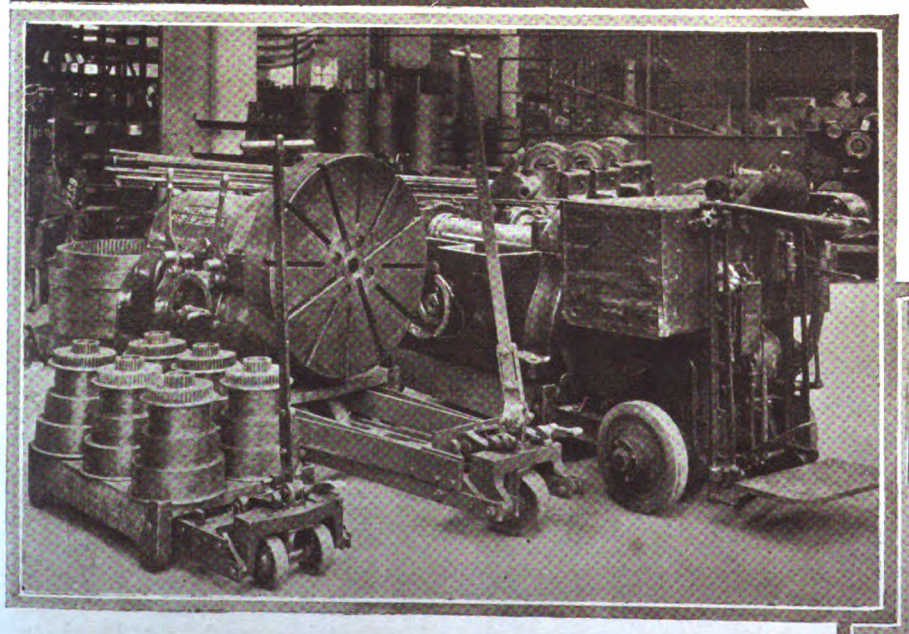
Asst. Superintendant, R. K. LeBlond Machine Tool Co.



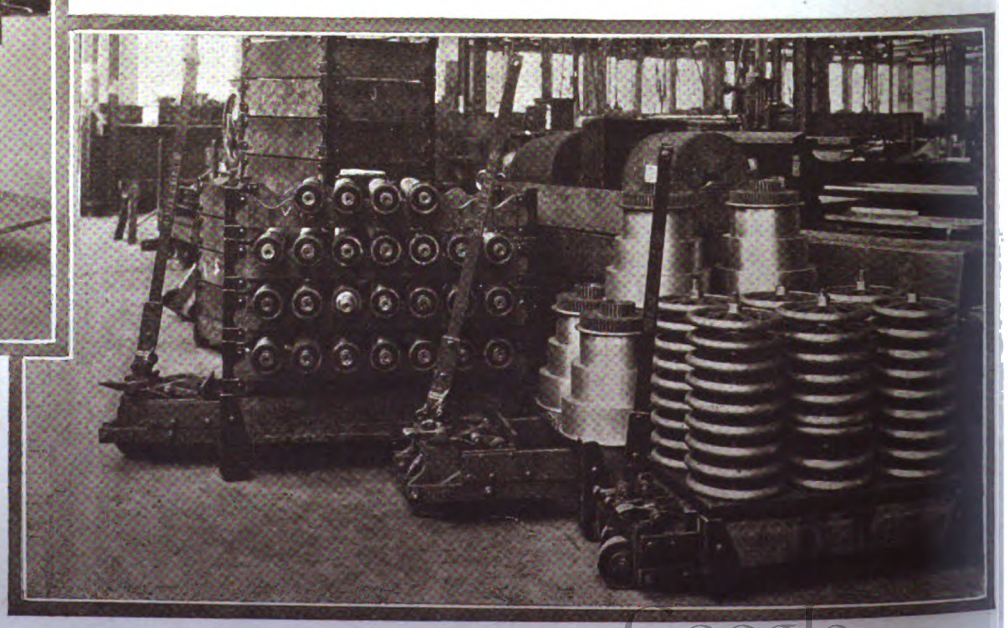
Below—One headstock is in the jig, two are on the floor beside the operator. Note how tools are placed, in order of operations, on the platform. Electric hoist (not shown) is used to lift heavy tools from platform to jig.

All posts are numbered, along the wide aisles, as a guide to truckmen; and cross aisles are lettered.





Above—Showing the use of Stuebing Hand Lift Trucks and an Automatic Transportation Electric Truck, in finished stock storage department.



At the right—Hand-wheels on the way to polishing department; head-cones ready for the same department; and lathe head spindles in process. Note protection given the latter in transit.

THE R. K. LeBlond plant, located in Hyde Park district of Cincinnati, embodies some of the most modern ideas in shop construction and has been planned with the view to making it possible to pass the work through the shop without unnecessary trucking or transportation; the raw mateerials entering at one end, and the finished product passing out at the other. The extreme width of the one-story saw tooth roof building is 350 feet, and the extreme length 725 feet. In addition, there is a four story administration building 75 feet x 300 feet.

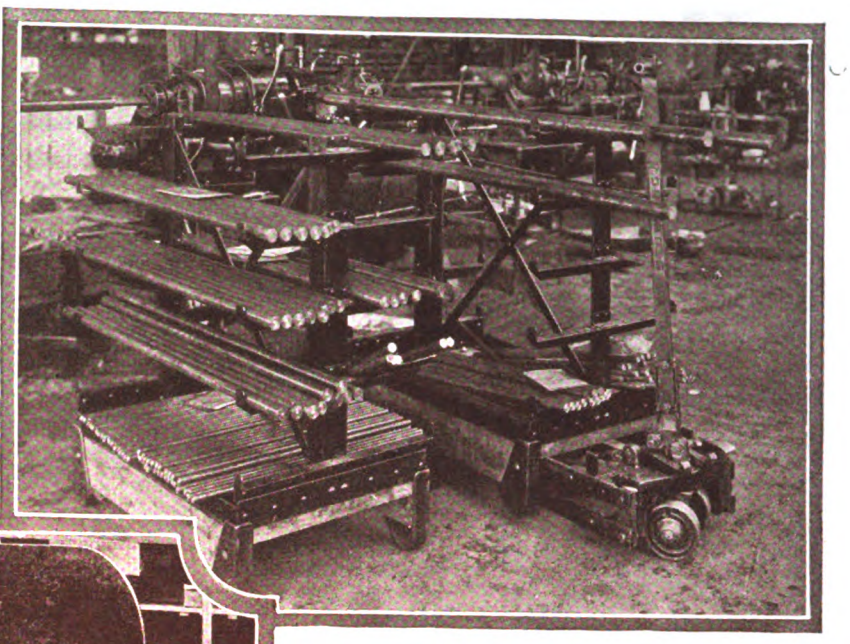
All posts are numbered along the long wide aisles as a guide to truckers, in the lengthwise direction, all cross aisles are lettered in cross direction. The lettered aisles represent avenues, and the numbered ones, streets; the trucker readily locates the loading and unloading stations in departments, designated by the routing card. Lines are painted a bright color on the floor to indicate the space set aside for aisles, and no machinery equipment or materials are allowed to project into this space indicated.

Three classes of trucks are used. Two (2) Elwell-Parker Electric Trucks, Type I. B. 4000 lb. capacity. Three (3) Automatic Transportation Lift Type Trucks, Type L. I.

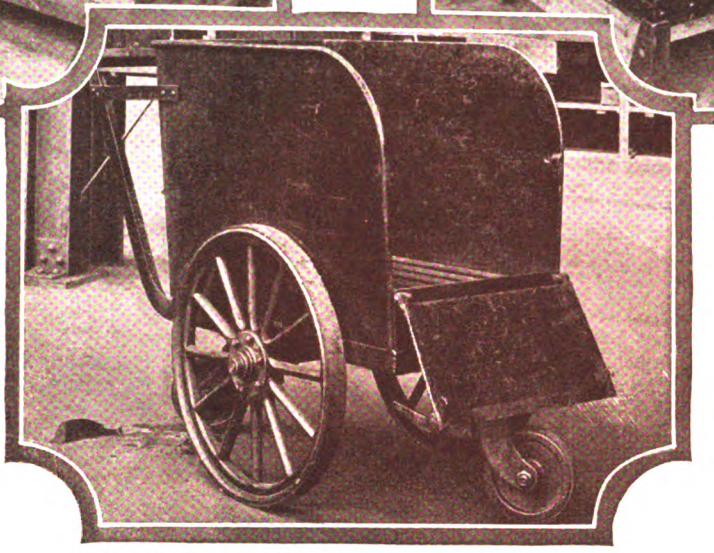
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Note the built-up frame platform, at the left, for conveying cast iron sleeves after boring. In the center is a platform loaded with unit trays carrying parts that have been ground.



Angle iron unit rack, mounted on standard platform, for transporting bar-stock to the automatic screw machine department.

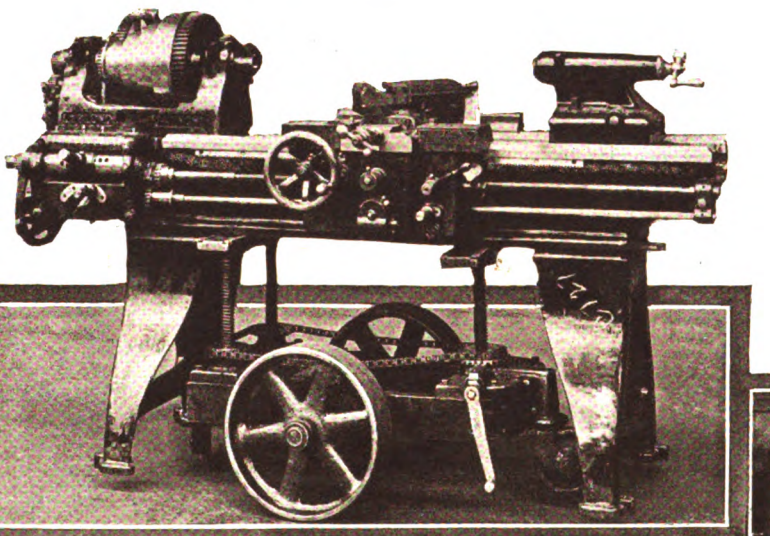


Ice truck especially designed to carry ice to the fountains. Leather-tired for noiselessness, and designed to keep the floors free from drippings.

4000 lb. capacity. Stuebing hand lift trucks, Type K 948-105-8, 8000 lb. capacity. Stubing hand lift trucks, Type S-6-36, 3000 lb. capacity. The hand lift trucks are used in individual departments in placing the work as indicated by routing and planning cards. The Electric Lift Truck handles all work to and from all loading and unloading stations, the Stuebing hand trucks are used to place work at the designated machine, are used for emergency calls (that is the Large Type), Small hand lift trucks (Stuebing) are used for all small platforms. The Elwell-Parker Trucks are used for general merchandise, received each morning by express, handling the trailer for bar stock and other details that could not be handled on platforms on account of overbalance. The trucker gathers up the empties as he returns to the storage dept.; of course a few are always left in each department. Formerly all our work was handled by hand push trucks, many workmen suffered injuries from the use of these high built trucks, the work had to be handled many more times, the floors could not be kept clean, piles of work toppled over and caused the above stated injuries, and it required a large force of laborers to keep the work on the move, and created no end of dissatisfaction on account of the drudgery in connection with same. The R. K. LeBlond Co. installed this new system three years ago. By the use of the above mentioned trucks we reduced the cost of handling 65% and it has proven a safer and surer method of handling as well as cheaper.

(*Continued on Page 42*)

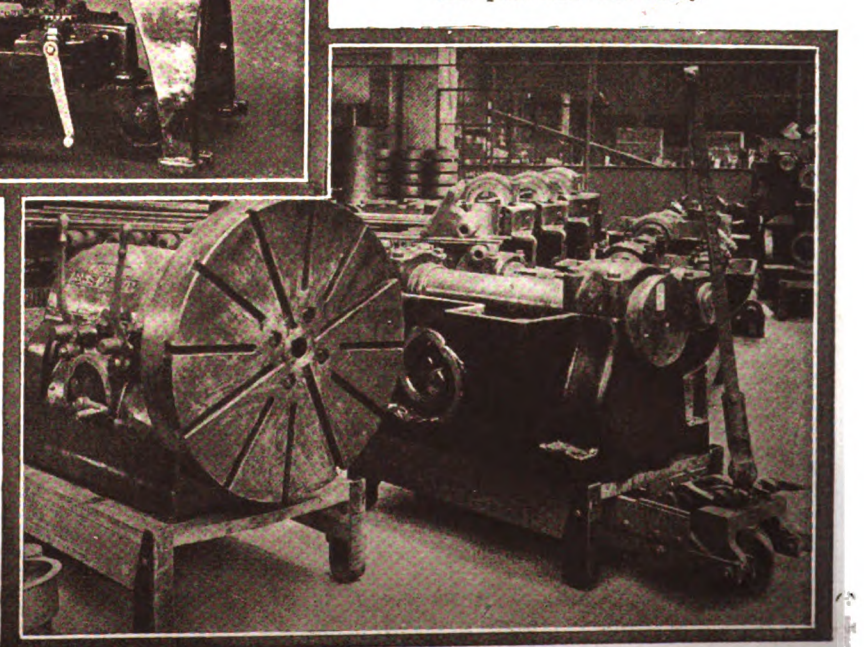
Below—a special truck, designed by the Le Blond Co., for moving small lathes. The three jack-screws operate by the single crank.



Unit trays loaded with finished details to build lathe aprons. (These are checked with loading list, to avoid error.)



A 36" Heavy Duty Headstock, weight 448 Lbs., on large platform; giving an idea of the load this platform will carry.



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Widening Electricity's Use in Industry

Are We Entering The Real Electrical Age?

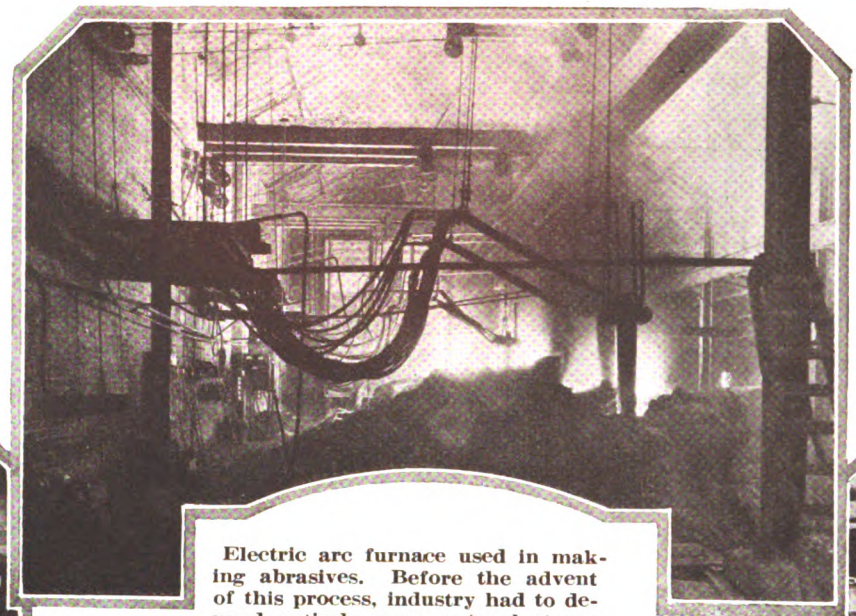
BY REGINALD GORDON

ELECTRICITY is such an indispensable adjunct to modern life that few people fully realize what it is doing to facilitate industrial operations. Light, heat and "power *where* you want it and *when* you want it" are the outstanding features of modern electrical development; but more than this, electricity is doing things impossible of accomplishment by any other means, making possible new methods of extraction and preparation of materials and rapidly improving, in many respects, the conditions and surroundings and lightening the tasks of industrial workers.

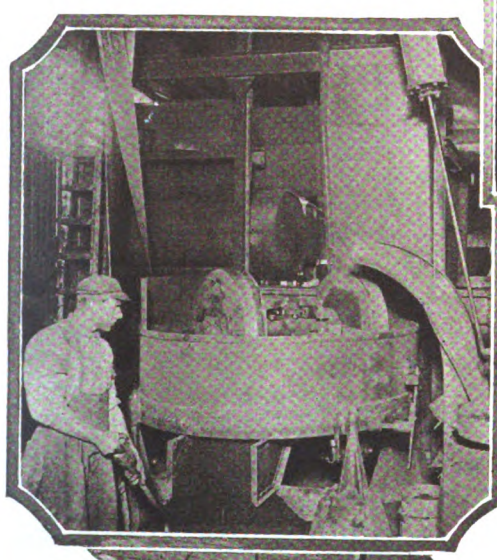
As applied to lighting, electricity has been developed to the point where for any given purpose, operation or process, the exact degree of illumination required is known and the engineer can choose the kind, intensity and distribution of the lamps required to produce the desired effect with the certainty of a satisfactory result. The effect of proper illumination upon the output of factory workers is known and progressive industrial managers are giving closer consideration to the lighting of their establishments than ever before. Flood-lighting, the illumination produced by a number of high intensity light units with reflectors concentrating their beams upon buildings or large areas, enables work to be carried on at night with the same facility as by day. During the war, flood-lighting not only enabled the contractors to build army camps and shipways in record time, but it was also universally employed to protect munition factories against marauders and spies who might otherwise have got past the guards.

For heating, electricity has been applied with increasing rapidity in industrial work. For large or small quantities

(*Continued on Page 21*)

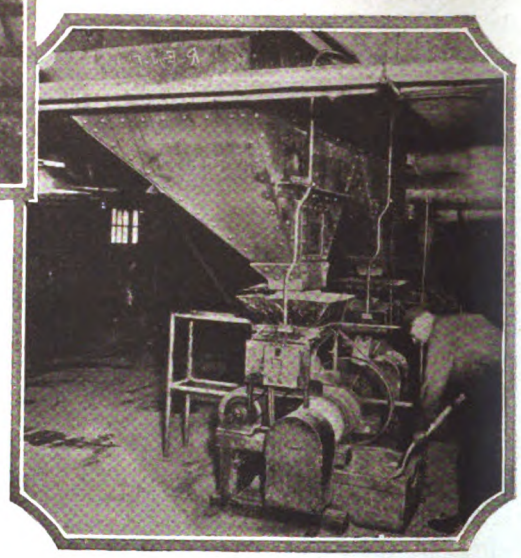


Electric arc furnace used in making abrasives. Before the advent of this process, industry had to depend entirely upon natural stones which could not be adapted to delicate grinding operations.

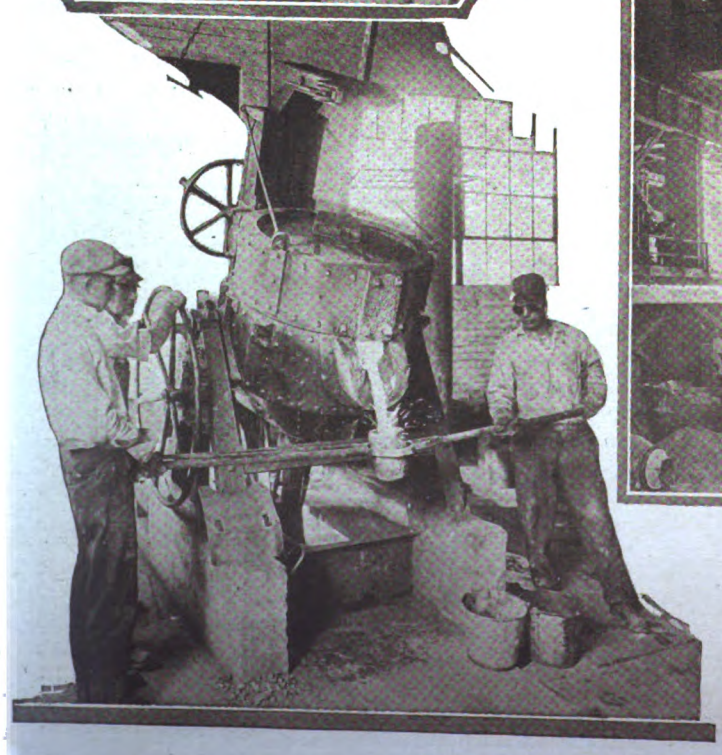


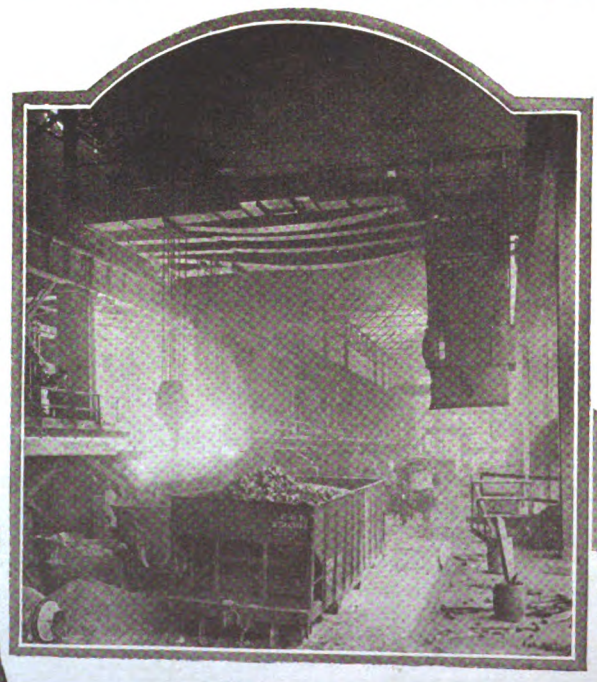
The modern foundry grinds and sifts its sand electrically, with consequent saving of space.

The electro-magnetic separator, in conjunction with sifter shown at the left, reclaims iron from the molding sand.



Below—Enamelling oven, such as is used for baking enamel on large parts. Electric heating units permit even temperature control.





A 125 ton electric ladle crane which is doing its share to reduce steel costs in a Buffalo steel plant.

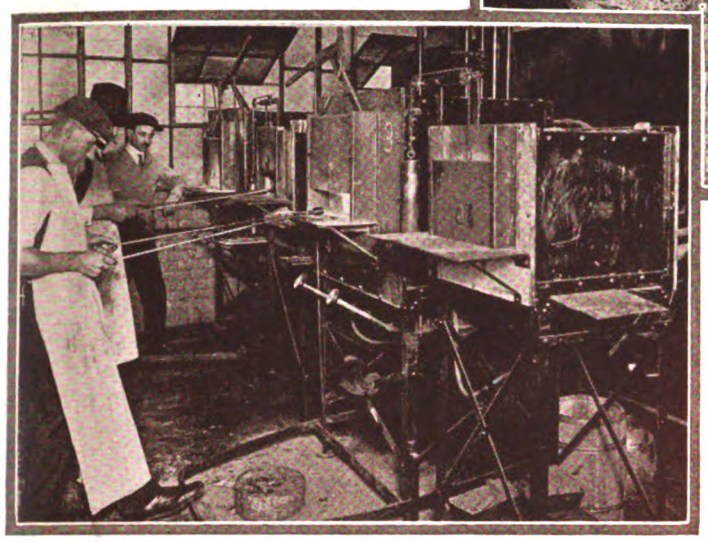


At the left—a Snyder Electric Furnace used in the manufacture of Stellite.

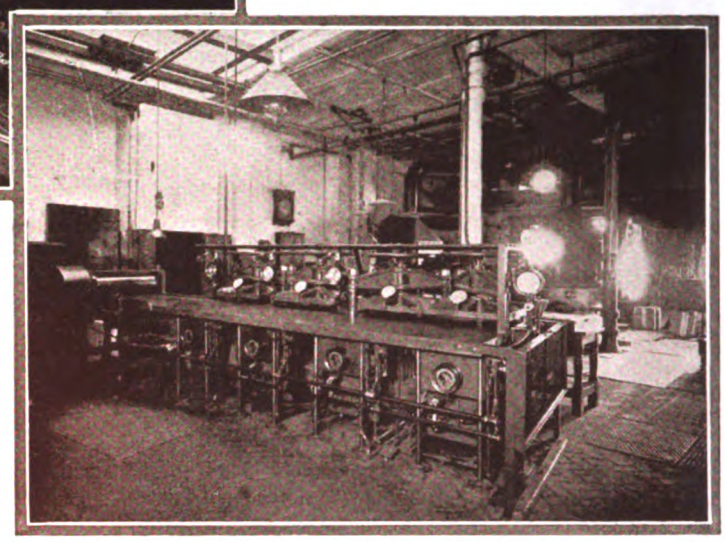
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Electric flood-lighting, which literally turns night into day, permits of twenty-four-hour work on important construction projects.



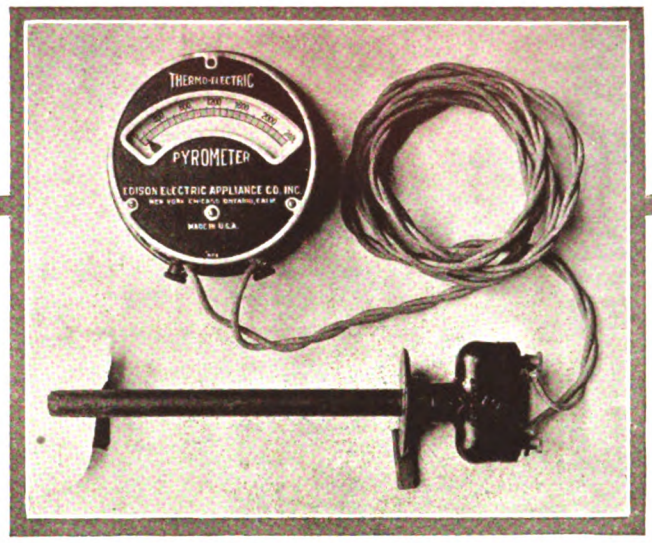
A battery of Hoskins electric tool furnaces installed in the Dodge Bros. Motor Car Co.



Electrically-heated matrix dryers with automatic temperature control, used in a newspaper plant.



Shaping a felt hat by means of an Electric Hand Flat. Heat is regulated by rheostat shown.



The electric pyrometer has made it possible to measure accurately the high furnace temperatures which used to be gauged by color.



Electric soldering iron with special rack which cuts down the current just enough to keep the copper warm.

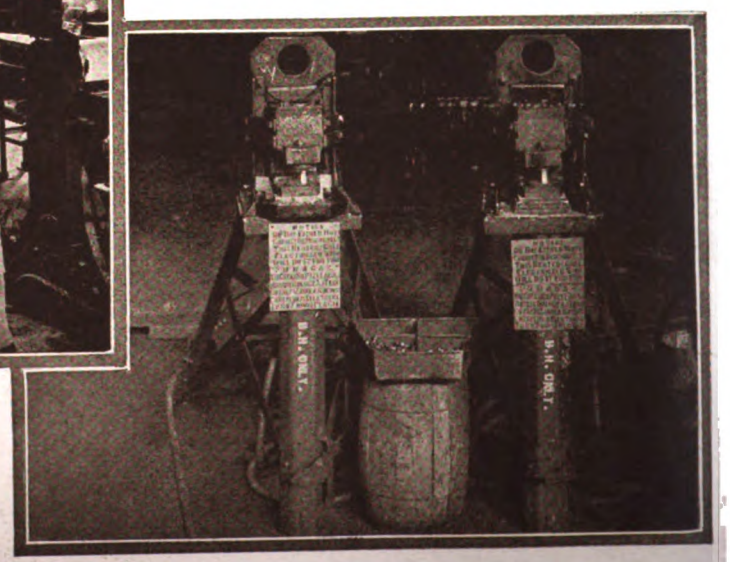
Below—a portable electric drill especially designed for work on large plates and girders.





At the Bureau of Engraving, Washington, some 600 of these electric printer's stoves are in use in the production of bank-notes.

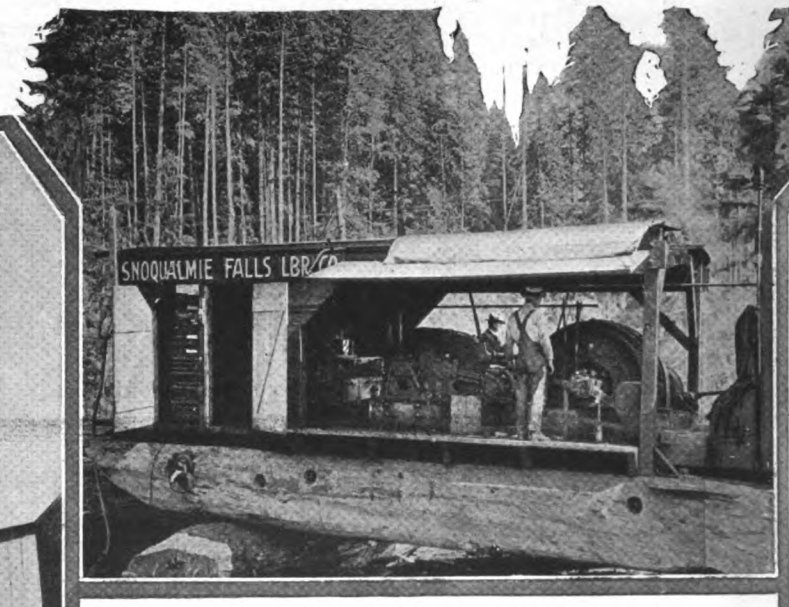
Resistance type of electric rivet-heater, which did much to help our ship production during the war.



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This photograph shows how the Cottrell Electric Precipitation Process prevents the dissipation of cement dust into the air. (See illustration at the extreme right).

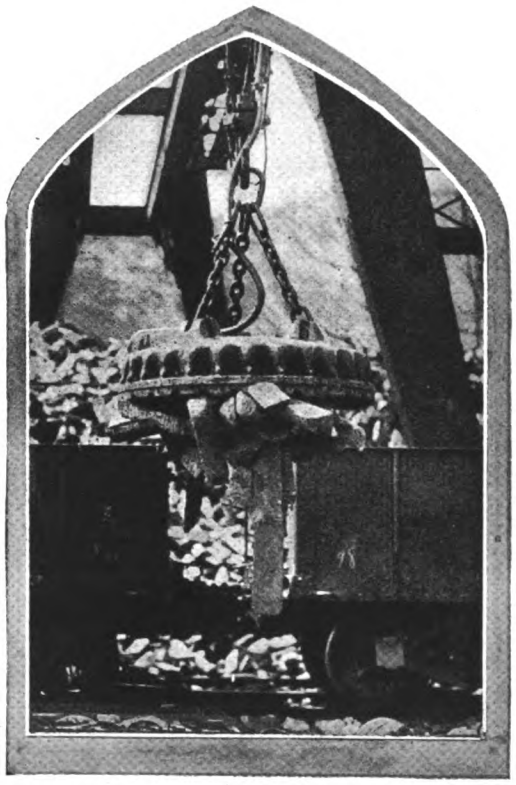


The Electric Skidder, which is in many cases replacing the Steam Skidder in the big woods. Performing the same functions, it does the work to better advantage.

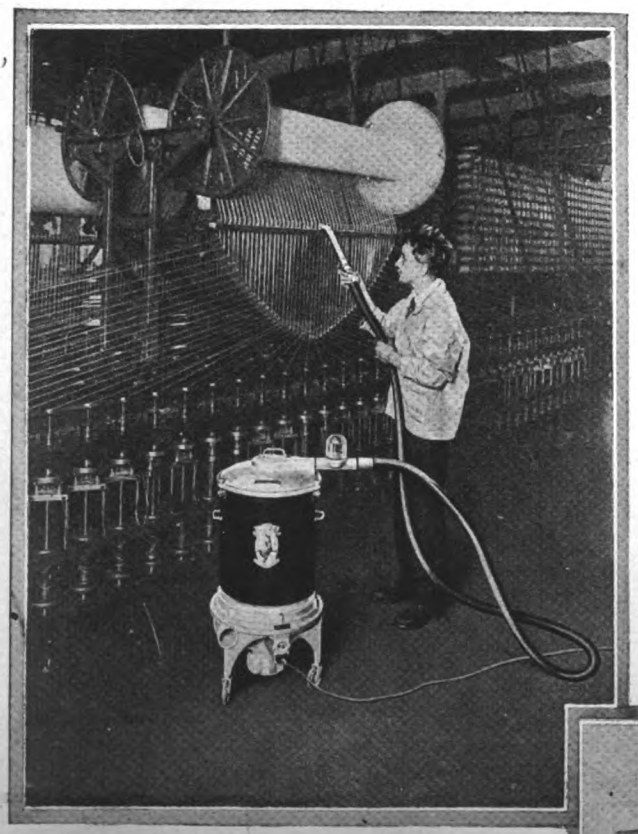


The same cement mill as shown at the left; but with the Cottrell Process not operating. The same process is applicable to smoke and fumes in any industry.

Figure for yourself how many man-trips would be necessary here—



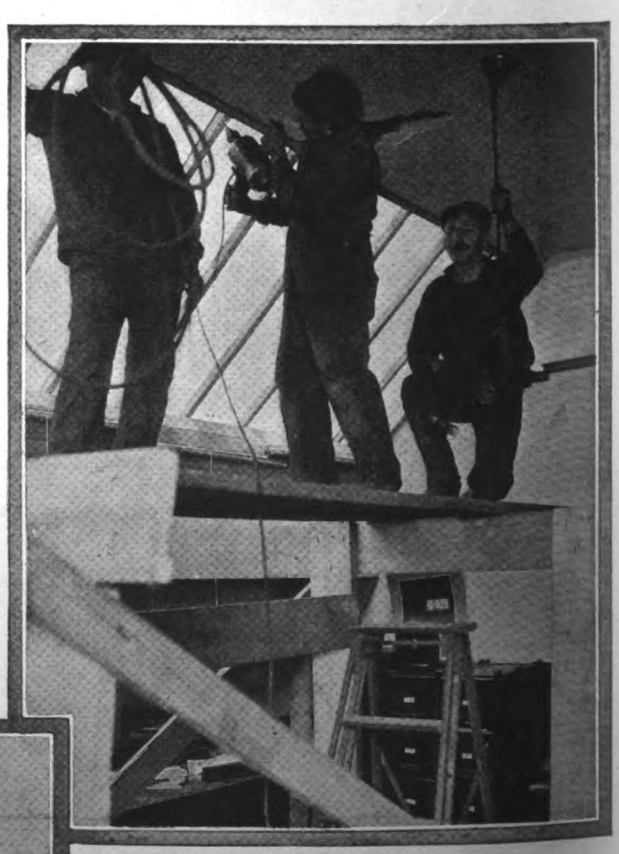
—picking up 38 machine-cast pigs, averaging 85 lbs. each.



The vacuum cleaner is not merely a home convenience; many textile mills find it valuable for removing dust and lint.

Below—The electric glue-pot keeps glue just right, with a minimum of attention, and without "sloppiness."





But for the portable electric drill, repairs and alterations would involve far higher labor costs than they do.

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At the left is shown a modern sewing department. Electric sewing machines have eliminated the confusion of pulleys and belting.

At the right—electric cloth-cutting machine, which cuts out many patterns at once and at incredible speed





By putting a special tip in the soldering iron, it becomes an ideal tool for melting sealing wax and flowing it in to seal screw holes.

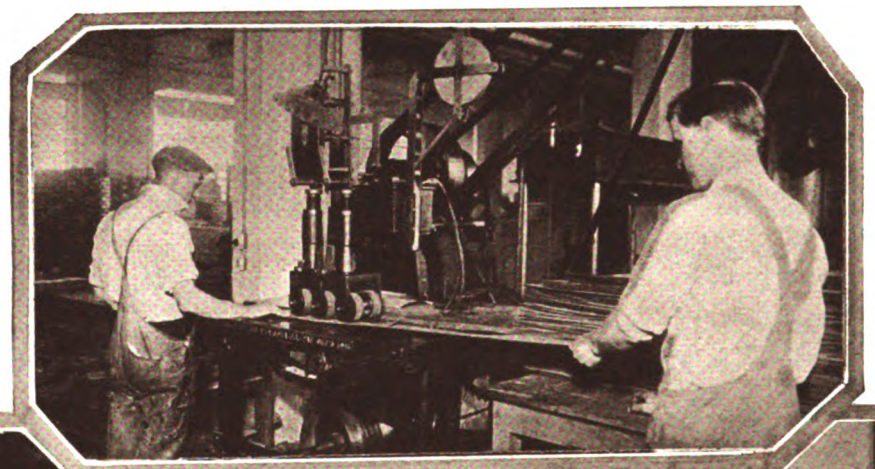
(*Continued from Page 18*)

of heat, at any degree of temperature, there are forms of electric heaters applicable to whatever process is concerned. Soldering irons, glue pots, candy cookers, linotype melting pots, baking and enameling ovens are but a few of the many devices through the use of which, manufacturing is rendered cleaner, safer and more dependable by means of the employment of electricity. Electric welding makes possible the repair of large metal parts in a highly economical manner because the power for heating is brought to the work, thus often avoiding the slow and expensive dismantling of large engines and machines and furthermore, the heat can be regulated to the exact amount necessary to effect a perfect union of the surfaces at the fracture. In the manufacture of certain articles in large quantities, the parts can be welded on the bench, often by women operators at a cost and in a manner impossible by any other method. In railroad repair shops, broken frames, cylinders, driving wheels and other locomotive parts, as well as bent or broken frames of steel cars are electrically welded with the greatest facility. Many emergency repairs in shipyards are effected by the same process. In this connection, too, the electric rivet heater was one of the most valuable aids in hastening the building of ships during the war, for it heated rivets faster and more uniformly than a coal-fire forge and with less attention.

Looked upon at first with doubt as to its capabilities, the electric furnace has gained a place for itself in steel making that gives it the preference for many purposes over those using fuel. The temperature can be exactly controlled, and owing to the melting taking place in a de-oxygenated atmosphere, the chemical reactions in the furnace are also more dependable. The United States Navy has an armor plate plant in West Virginia

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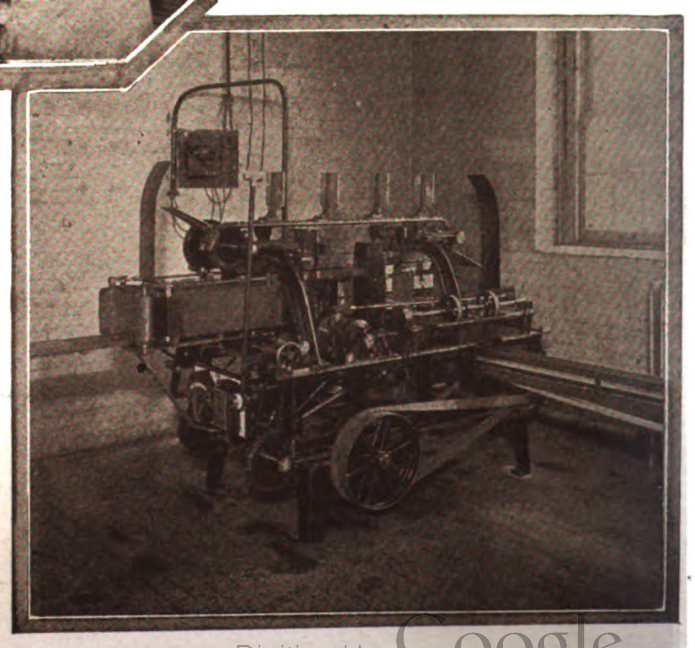
Below—a special type of electrically-heated glue-pot machine, used for gluing tape for veneers in a musical instrument factory.





At the left—one of the electric mail-sorting machines used by Uncle Sam to speed up the postal service.

At the right—an electrically-heated wax wrapping machine in use in a breakfast-food plant.



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Factors in Developing



Wm. F. Dobbins is Fourth Vice President of the Metropolitan Life Insurance Company, in charge of the Personnel, which consists of over 6000 employes in the Home Office. Formerly he had charge of production and organization involving supervision over numerous offices and 2000 men. His expressed opinions are the result of an experience covering thirty years.

Confidence Constitutes Loyalty

By William F. Dobbins

MOST human beings are keen critics of decisions involving personal justice or fairness. And, when they are employes, this keenness is intensified as concerns decisions involving themselves. In too many places this human characteristic is treated as a negligible quantity, with the result that, even when the motive is worthy of praise, it often receives condemnation.

In the absence of a fixed policy or ideal as regards the just treatment of employes, the assumed superior intelligence of the management it often used to promulgate specious rules which operate against the reasonable comfort and rights of the employe. When the benefit of the doubt in matters of close decision is generally given the management; when advantage frequently is permitted to go by favor or influences; when the personal

(Continued on Page 60)

The Golden Rule—and Loyalty

By R. B. Hammond

THERE was a time not very long ago when little or no interest was taken in the feelings of a foreman toward the management and likewise of the laborer toward the foreman. This was generally the condition of affairs throughout the industrial world and as might have been expected when viewed from the common sense standpoint then and fully realized by men of good organization ability today, the result was a lack of coöperation, good feeling and good will, in substance a sort of demoralization of the forces that work toward harmony and the proper functioning of any industrial machine.

Men of good judgment and prominent in business affairs today all agree, I think, that considerable regard must be shown for the other fellow and that certain so-called individual rights are more or less interwoven into the neighbors

(Continued on Page 29)



R. B. Hammond graduated from Rensselaer High School in 1909. He taught a district school for three years and then entered Purdue University in 1912, finishing a course in chemical engineering in 1916. Subsequently he was with the Western Electric Company of Chicago as works chemist, the Matheson Alkali Works of Niagara Falls, N. Y., in research work and is now with the Acheson Graphite Co. as department superintendent in the Carbon and Kiln Departments.

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Loyal Coöperation

Instructions Versus Orders

By R. W. Henninger

WHERE are we to begin to regenerate the confidence of the workers? Begin with the Foremen and convert them into a sales force to sell confidence to the employee under them. Confidence has its birth in Optimism. However, do not expect them to sell other than the product given them. If their superiors are manufacturing frowns and go stalking around like human cemeteries, your foremen will in turn be selling about as much life and spirit, as is possessed by the white slabs that decorate cemetries. People are not usually vigorous and high spirited among such surroundings, neither do they at such times think along channels that are conducive of productive thoughts.

Become an instructive inspector instead of a detective inspector, and have the foremen in turn become the same with the worker. Inspect to

(Continued on Page 60)

The Three Principal Factors

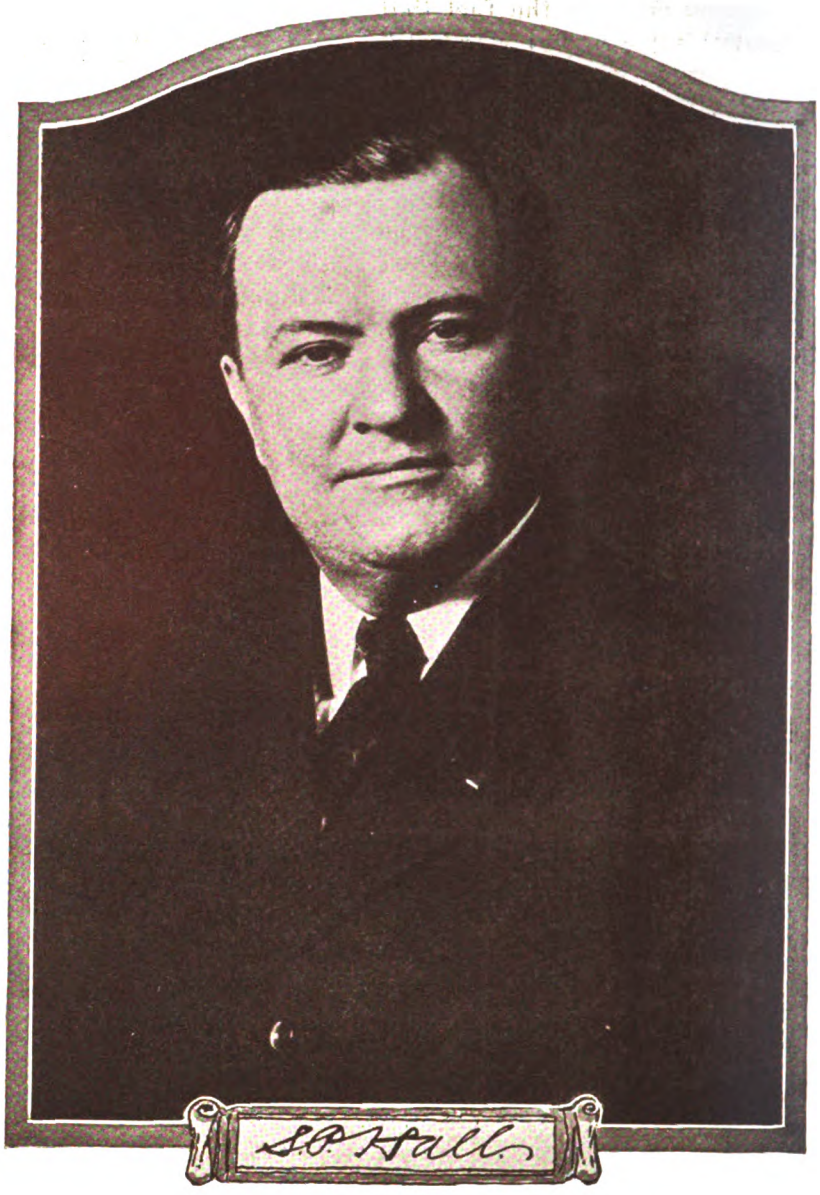
By S. P. Hall

IT takes years of patient study on the part of management and labor to lay the foundation for sound relationships. During the past few years great strides have been made in this direction through the efforts of employment managers who are in close contact with employees and who hear and meet their troubles long before they reach a disorganizing state.

The close contact of ownership and management with employees is of the past. The complex management of today including the details of finance and mass production, requires the energy and efforts of more than a few men, hence it becomes necessary for departmental divisions. Personal contact and the promotion of loyalty has fallen largely to that department known as Industrial Relations.

From 1914 to 1918, management, pushed to the limit for

(Continued on Page 48)



S. P. Hall, Employment Manager of the Morgan Engineering Company, Alliance, Ohio, and the Canton Steel Foundry Company, Canton, Ohio, is a graduate of Dickinson Seminary, Class of '97. For several years he was construction superintendent on heavy masonry and grading of the Pennsylvania Railroad, and later was employed in systematizing the work in various plants of the Carnegie Steel Company. For the past several years he has been in charge of the Industrial Relation work of the above companies. He is past president and a member of the Executive Committee of the Stark County Employment Managers Association, a Member at Large of the City Council of Alliance, and is prominent in civic and fraternal organizations. Mr. Hall served as director of The National Industrial Relations A. A. during 1919-20-21.



Roswell W. Henniger is the Director of Employment and Service of the Miller Lock Company, of Philadelphia. Previous to taking up his work with this company he was a state co-operative agent for the Government. Mr. Henniger believes that example is better than precept, and instructions more effective than "orders."



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Building Roads of Coral

Man-Made Concrete Cannot Compete with this Age-Old Natural Product

By May Wilkinson Mount

EVERY now and then this nation rubs its eyes and awakens to the fact that something new and wonderful has arisen from government enterprises—something of very special benefit to the people at large. While conditions with respect to food shortage harass one section of the globe, the public in this country has just aroused to the fact that, in its quiet way, our government is reclaiming enough land from the rich agricultural bed of the Everglades in Florida, to feed the entire nation.

As a people we learned this in two ways: Some were curious to learn where our breakfasts-de-luxe came from; our grapefruit, oranges, avocado pears and the plump kidlets which supplied our "lamb" chops: from whence came the fat turkeys, midwinter strawberries, pineapples and vegetables which load our January tables? Then we learned that reclaimed land in the Everglades was providing a large share of our sumptuous delicacies and placing them within the reach of persons who could never have afforded such luxuries before.

Our other source of information flows in on the wake of tourists who have motored along the Tamiami Trail and seen, for themselves, thousands of acres of farm produce and livestock luxuriating where not long since several feet of black water laved the ancient "cypress knees" of Florida's great swamp, and gray moss hung like a pall that screened the face of beauty from passing throngs.

It is some time ago since Columbus taught us that the way to discovery led by a good road. He took the highroad of unchartered seas: Florida traced roadbeds through its dismal swamps; government acumen dug canals along these routes, drained them, and now, where alligators were wont to sun their mossgrown backs, the native hibiscus glows red through groves of palms, and and poinsettias trace arboreal pictures of crimson glory upon the coral villas, gateways and snowy walls of Miami.

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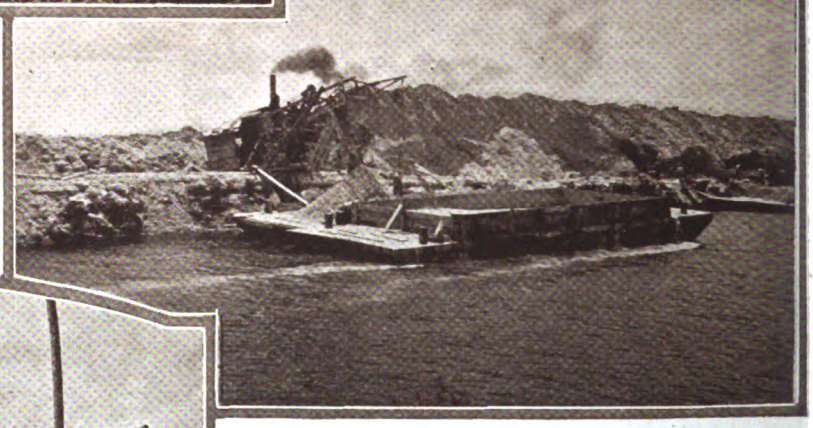


Big steam shovels scoop out the rock from the coral pits, after it has been blasted.

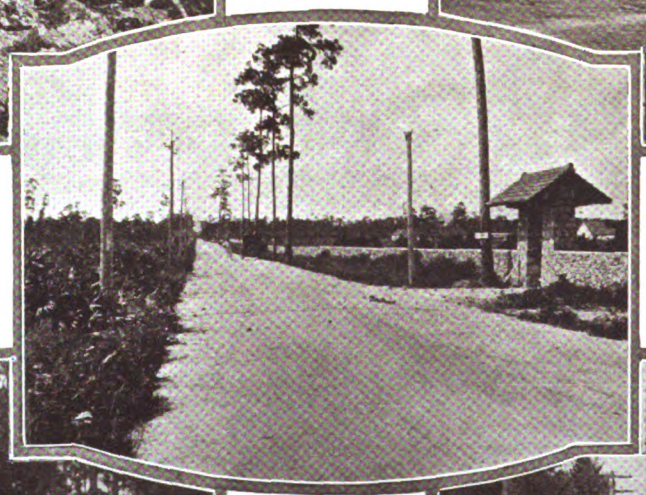
In the center panel, below, both the road and the fence and gateway are built of coral.



Above—Unloading the coral rock on a new road in Miami, Florida.



After quarrying, the coral is loaded on barges, for transport via the Miami Canal.



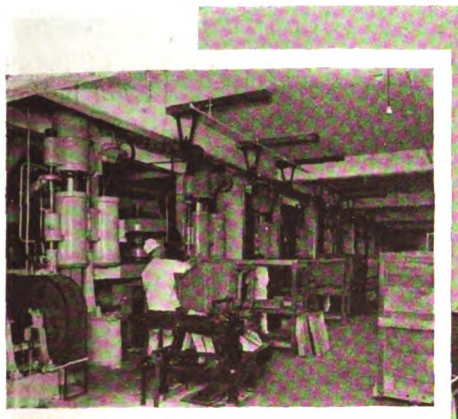


Road under construction, and nearing completion. Sand has been applied over the coral rock (oolithic limestone, by the way, is its unromatic scientific name).

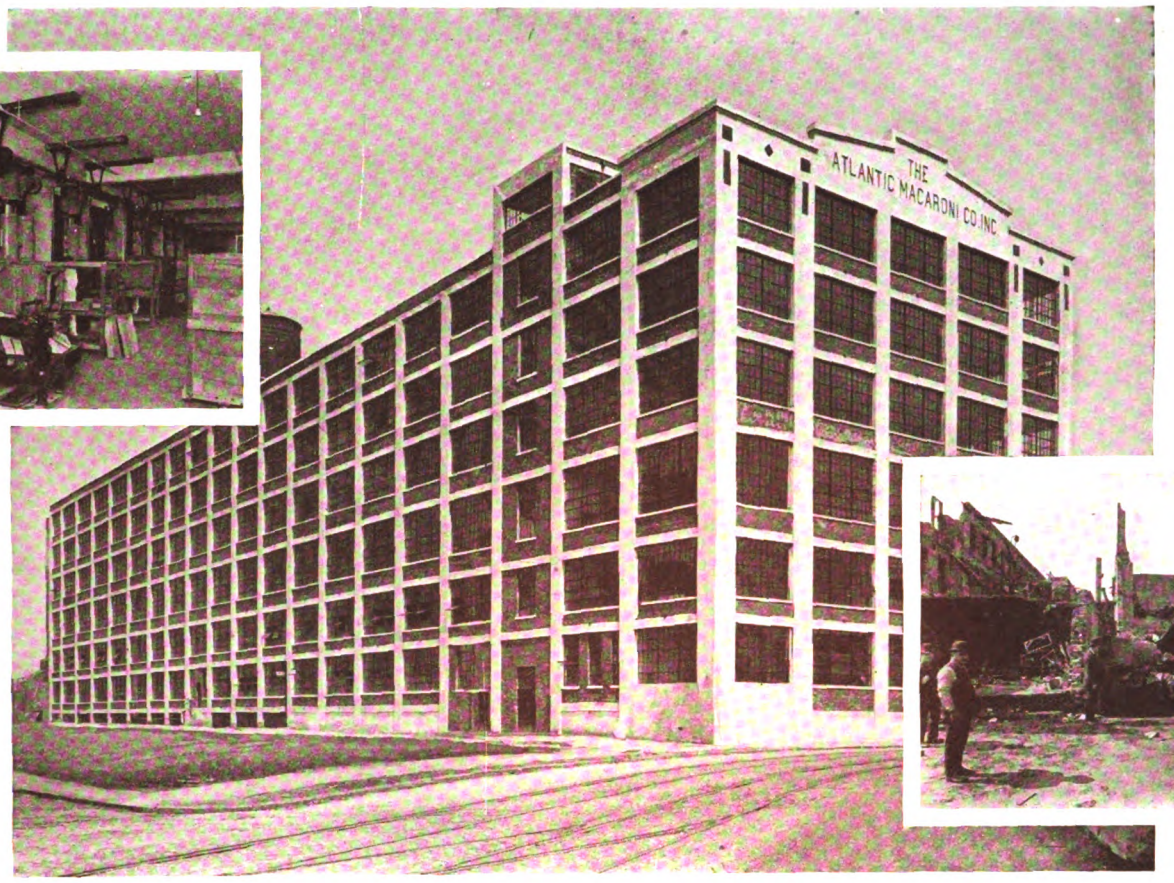


Many eons ago—long before concrete was known—Coral polyps constructed the material which is now used in building the famous motor roads of Florida.

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Macaroni Machines in Operation





The Old Plant After the Fire

New Home of the Atlantic Macaroni Co., Inc.
Long Island City, N. Y. *King & Campbell, Architects*

And the Atlantic Macaroni Co., Inc. said: "Let WHITE build it of CONCRETE"

WHEN fire destroyed this company's "old mill construction" building, they had little time to lose in getting started again. The building shown above is an excellent example of the modern fire-proof, concrete industrial building. *White* can help you equally well in any emergency.

Send for actual photographs of recent White-constructed buildings

CONCRETE WHITE CONSTRUCTION CO. INC. NEW YORK

WHITE CONSTRUCTION CO., INC.

95 MADISON AVE., NEW YORK, N.Y.

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Light as a Production Factor

By Russell J. Waldo

ONE of the most important factors of production is that of properly lighting the work place; important because it lessens labor, improves the environment, and lessens accidents. Moreover, good lighting decreases spoilage, which is one of the greatest wastes in the manufacturing field. It is strange how many business leaders expect the maximum of production with worn out machines and a dark plant. Regardless of how efficient the worker may be, he is greatly handicapped by improper lighting. To produce his best the worker must be working in a room that is adequately lighted, where he will not find it necessary to go to some light or window to make sure that he has done a correct piece of work. In the latter case it is often necessary for him to stop his machine while he does this, thereby reducing his productive ability.

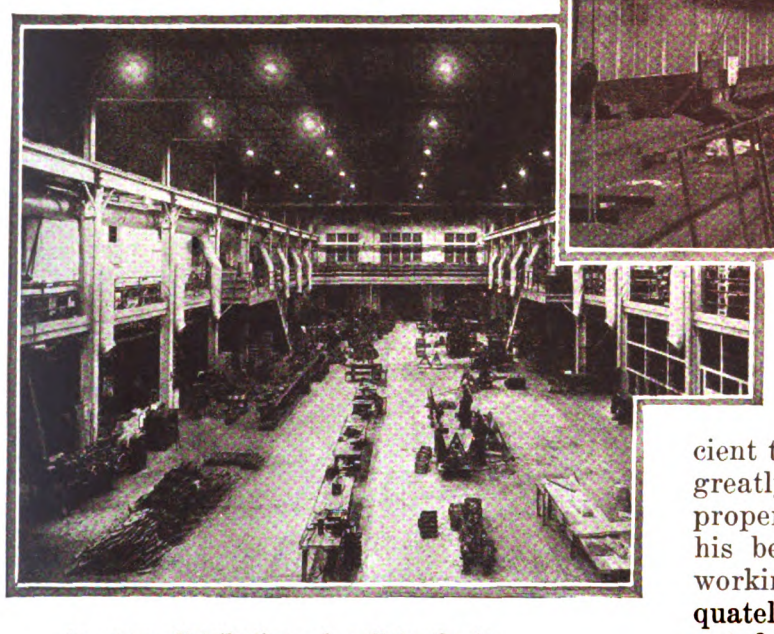
Where scientific principles have been introduced into modern factory systems, and the lighting problems carefully taken up, there has been a noticeable improvement in the quality of work turned out, and a decrease in spoilage. This has helped to decrease production costs. In fact, it is surprising how many manufacturers depend upon better standards of lighting to aid them to accomplish this aim.

Because the man who works in the well lighted shop is able to complete more and better work, more light has been added to the plant. With the coming of more light, the plant morale has in turn been greatly improved. The writer knows of scores of instances in sev-

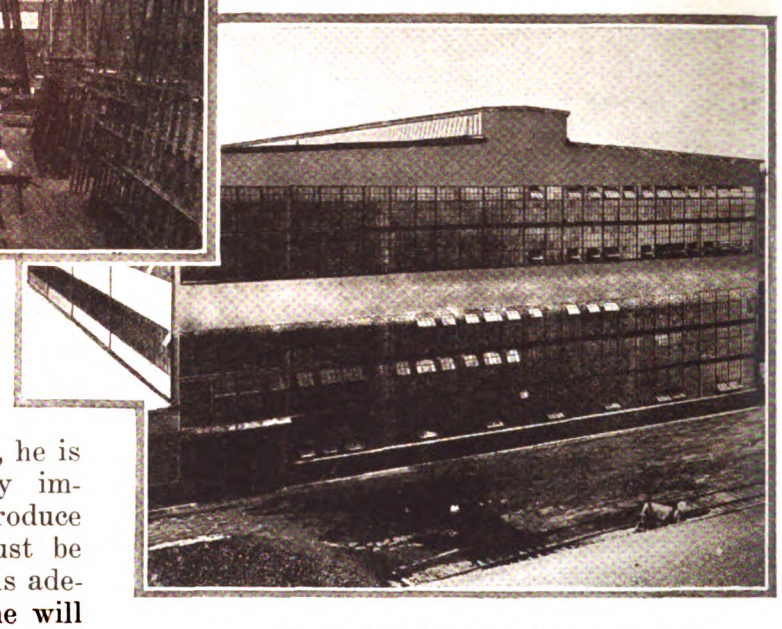
(*Continued on Page 59*)



A well lighted work room at the plant of David Lupton & Sons, where saw-tooth roof and light-reflecting side-walls give adequate illumination.

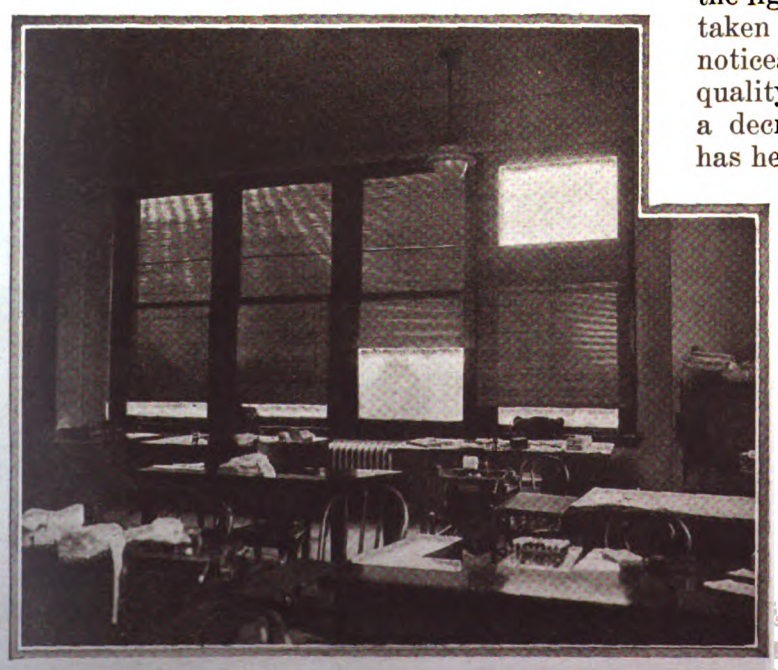


An even distribution of sufficiently intense artificial light, as above, tends to stimulate production and lessen accidents.

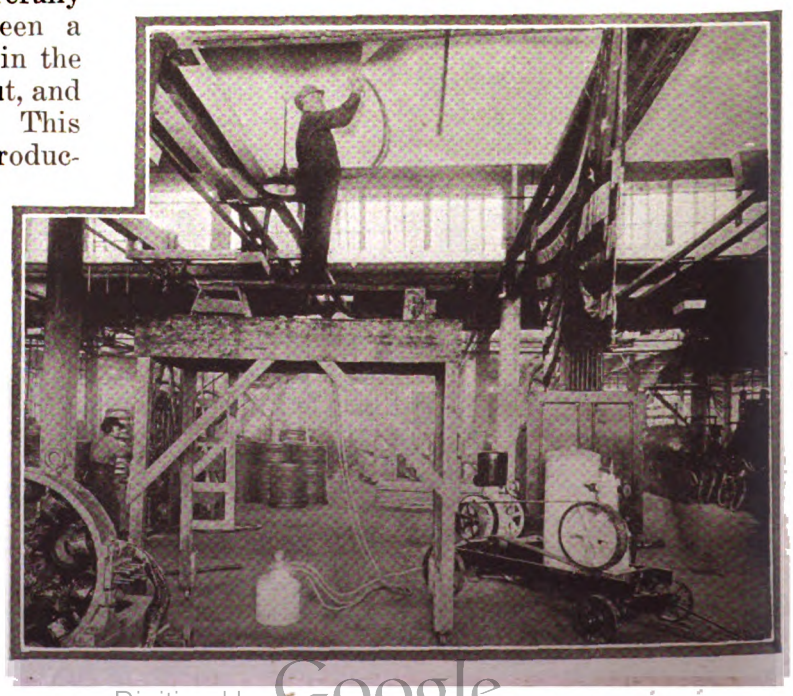


An example of the modern "daylight factory," where only the necessary columns and framework are non-transparent.

Below—Lattice shades can be put to good use where glare is to be eliminated. They permit ventilation, and admit a diffuse light.



Below—the importance of reflected light from walls and ceilings has led manufacturers to give proper attention to painting these surfaces.



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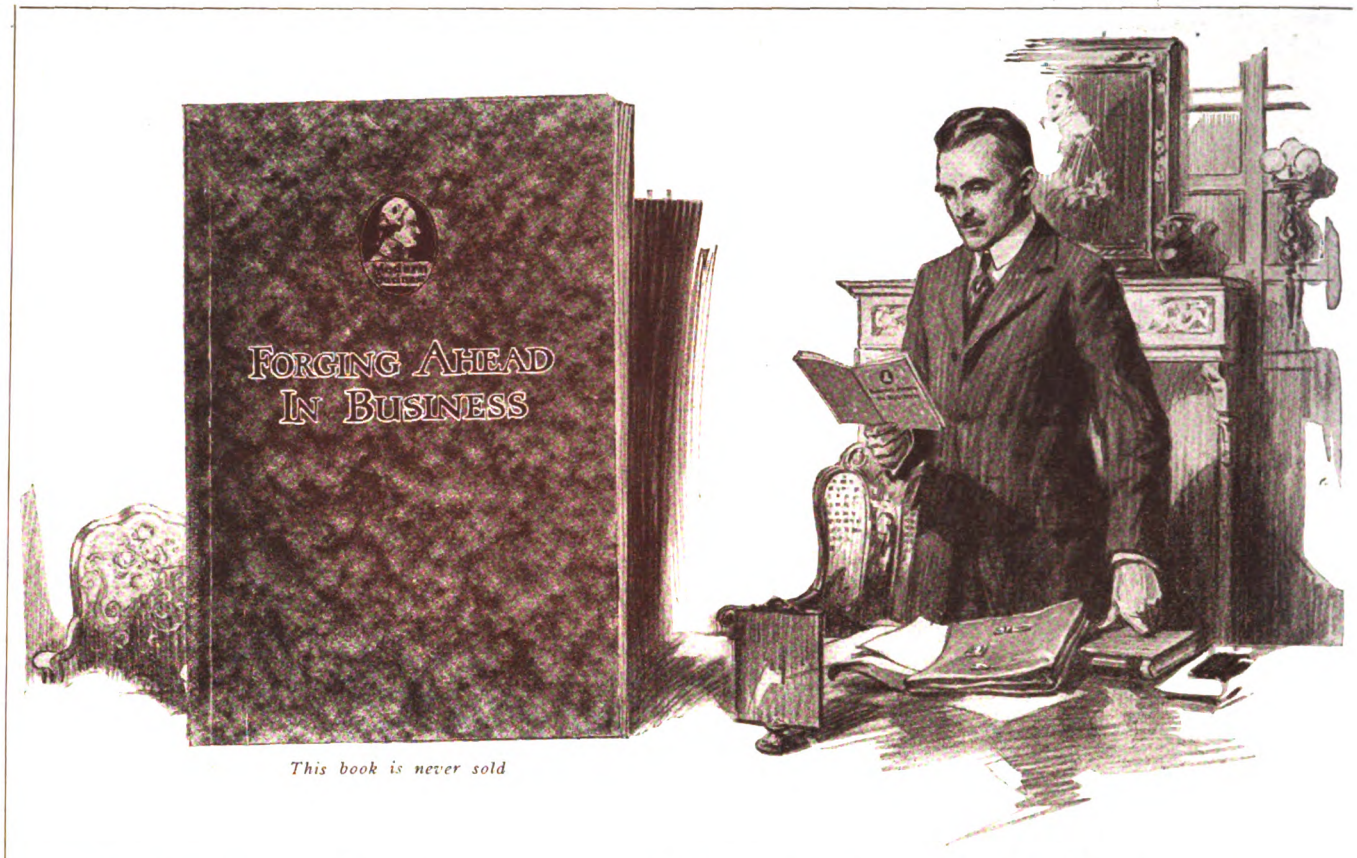
The Golden Rule—and Loyalty

(*Continued from page 22*)

rights, in some cases to such an extent as to lose the mark of individualism. What was once thought about the foreman's place in Industry has given way to an entirely different attitude and today we find him occupying one of the key positions in industrial organization, mainly, a direct connecting link between what is commonly termed management and labor with the recognized power of putting things across to his men in a way to bring good results or bad results. By good results I mean whatever contributes to efficient production of commodities for sale, good will of the men toward the management and general contentment among the working force. A willing worker is the master key in the hands of a good manager and is the means of opening the door which leads to maximum production, and maximum returns on whatever is invested in the business. Now in order for a worker to be willing and earnest, he must be contented and in order that he be contented certain things have got to happen.

A certain class of men will take a lot of punishment if the pay envelope is fat enough and we call this class, "pugilists." However, very few of the men in our factories are pugilists by trade or profession or way of thinking and are therefore, not looking for punishment of any sort in order to earn their daily bread. All workmen, of whatever nationality or creed, have a common feeling of right and wrong treatment embodied in the act of playing square or not playing square. I think personally that there is no other one thing which will do so much to break the morale of the average workman than to give him good reason to believe you are tricking him by showing partiality to another workman and thereby *stealing* from him certain privileges he should share, by *out and out* lying in order to cover a mistake or hide a fact for the instant because it seems the easiest way. A man to man feeling of the sincere and earnest variety, frank and above board in all dealings, always ready and insistent that the cards be shown face up on the table are the best methods to use and when used no "ifs" and "ands" and "misunderstandings" can find very fertile soil for growth. Confidence is the outgrowth of playing square and when you have a man's confidence, you have a lot that will help you both.

You can build soup kitchens, recreation halls and tennis courts; publish plant papers until the end of all time and still have a dissatisfied working force. Why? Because you cannot buy square play, confidence, good will and cooperation with money. These valuable things are gifts of the heart and inexpensively acquired if the Golden Rule is properly applied. "Do unto the other fellow as you would be done by." A good many knotty questions have been settled to the satisfaction of everybody concerned by the simple application of this rule.



This book is never sold

This book may not be intended for you

But more than 155,000 men found in it what they had been seeking

HERE is a slim little volume of only 120 pages. It is not the work of a famous writer. It is not illustrated by a celebrated artist. It is not even bound in leather; its covers are of paper.

Yet few books published in the English language have had a wider reading. And those who have turned its pages would not part with what it has disclosed to them for many, many times its simple value.

In itself it is only a key—but it is the key that has unlocked the door of the future for many thousands of business men. Alone, it cannot add one penny to your income nor advance your business progress a single step. But it is a guide-post that points the way for you to follow—if you will as others have.

That depends upon you. All the help that others can give you will be of little use unless you are strong enough to make a first effort and earnest enough to sustain that effort.

This page is a test of your initiative. It will partly determine whether this book is intended for you.

If the very title of the book—"Forging Ahead in Business"—stirs no response, then turn the page and think no more about it.

But if the phrase "Forging Ahead in Business" does awaken a response, then think of this: plenty of men have the power to start a thing, but few possess the courage and the stamina to carry through their undertakings.

So the question for you to answer is, "If I send for this book, if I find out more about the Alexander Hamilton Institute Course and Service, if I am convinced in my own mind that it offers what I have lacked—then is my resolution strong enough to help me to do what other men are doing?"

Doing what they did means a little money. It means more than a little time. You must ask yourself whether you will sacrifice both. If the answer is a positive "No," then it must be said that this book is not for you. No system yet devised can impart information by the miracle of telepathy.

But if you are frankly seeking to make yourself a better, more successful man tomorrow than you were yesterday, then start this coupon on its way at once.

Ask yourself this: "Why should any one pay me more next year than this year? Just for living? Just for avoiding costly blunders? Now that I am devoting most of my working hours to business, what am I doing to become more expert at business?" The answers to those questions will tell you whether to turn the page or mail the coupon.

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Widening Electricity's Use in Industry

(*Continued from Page 21*)

with two 40-ton electric furnaces that are reported to be highly satisfactory. In the making of alloy steels, a high degree of success has been attained with such furnaces, and brass melters are also adopting them. In the heat treatment of steel, electric furnaces have proved particularly valuable. Wherever a uniform, exactly controllable temperature is required, some form of electric heating is available, from the white hot furnace for steel melting to the ovens in which motor car bodies are placed for baking the varnish.

It was the electric furnace that gave us calcium carbide from which acetylene gas is obtained, now so widely used in oxy-acetylene welding and to a certain extent for lighting. Carborundum and other abrasives are produced in the same way, thus furnishing metal workers with an extensive line of wheels for coarse or fine cutting, grinding and finishing. By similar processes, the chemist has been enabled to make many new compounds unobtainable by any other means.

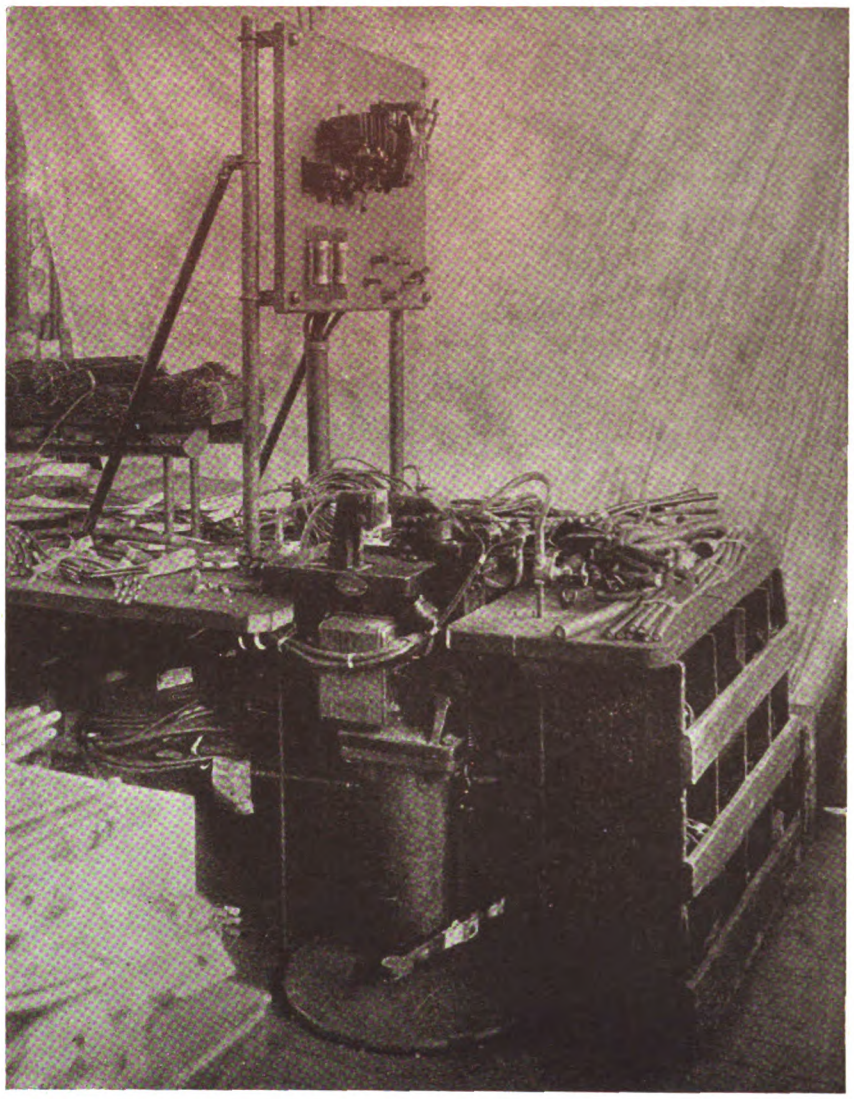
The suppression and precipitation of dust and fumes, both objectionable and highly wasteful is accomplished by the Cottrell electrical precipitation process. The dust rising from cement mills and fumes from the roasting of copper and zinc ores and in the manufacture of sulphuric acid are successfully caught and recovered, as shown in the illustrations on page 20.

The most useful instrument for high temperature work, the pyrometer, indispensable to the accurate determination of furnace temperatures, depends for its operation upon an electric principle. If two different metals are joined, and form part of a circuit, an electromotive force is developed whenever the junction of the two metals is subjected to a change of temperature.

Another notable application of electric power is the substitution of electric motors for the long-established and reliable steam engines in driving rolling mills. A 7,000-horse power motor was installed in a steel mill not long ago and is now driving a three-high roll train in a satisfactory manner. The use of motors is of course too large a subject to make possible anything more than a mere reference to it. Electric motors not only supplant steam engines in driving lines of shafting in mills and factories, but modern practice has found it better, in many cases, to drive each machine by an individual motor, thus doing away with a mass of belting from line shafts and eliminating the loss in the transmission of power caused thereby.

In the propulsion of vehicles, the storage battery and motor are doing great work, perhaps unnoticed by many people, because commercial electric vehicles are in a minority as compared with gas-operated trucks and cars. Besides these, there are thousands of intra-factory electric trucks indispensable to the routing and delivery departments of industrial plants.

Few of us realize, at first glance, how important an adjunct to its industrial applications are the domestic uses of electricity. The rising prices of coal and gas have not alone made possible the ever widening sales of household electric appliances, although they have had much to do with the result. The chief "selling points" of such devices are their convenience, cleanliness, ease of manipulation and saving of labor. Vacuum cleaners, irons, percolators, toasters, washing machines, fans, and sewing machine motors appeal to an increasingly large consuming public. All this reacts favorably on industry, as represented by the large amount of capital invested and the large number of men and women employed in manufacturing and distributing such goods.



Electrically heated terminal soldering machine of the General Electric Co.

Aside from the industrial applications of electricity, the development and utilization of this form of energy have had an effect on factory location and design. Formerly, unless a factory were built at a water power site, it was necessary to install boilers and engines as prime movers to operate the machinery. Nowadays, that factory is not obliged to add that entire outlay to its first cost, but can purchase electric power transmitted to it over wire circuits from a central generating station situated, it may be 150 miles away. Electric motors are installed and the mill then pays for the power as used.

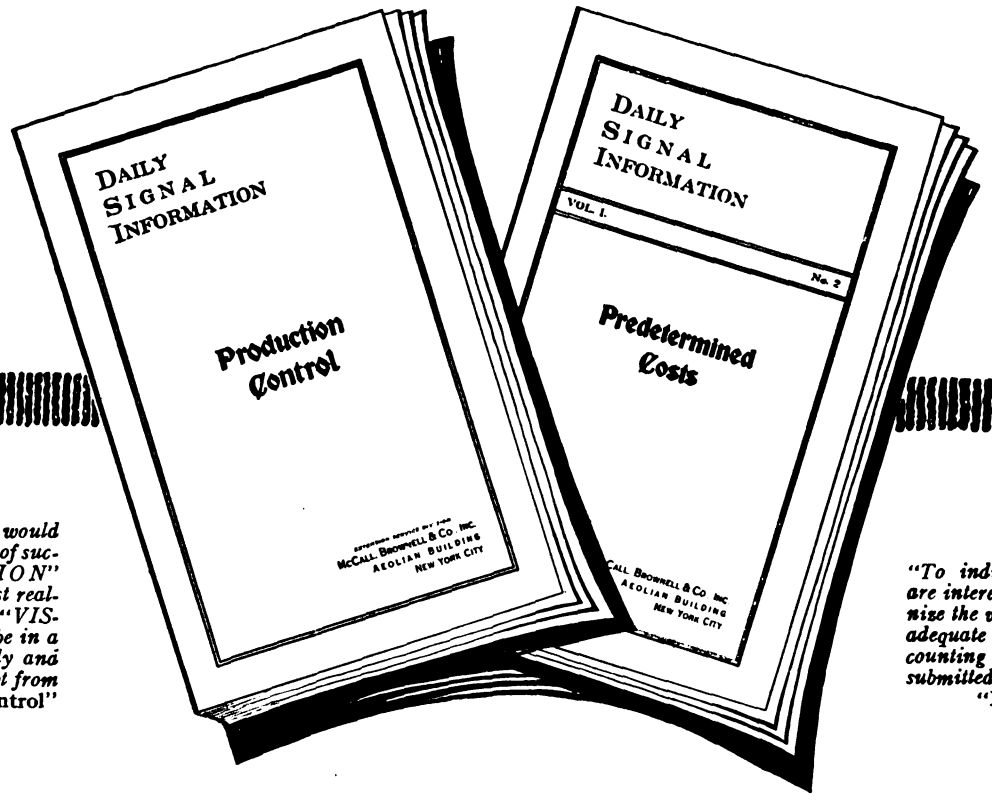
There are many regions of considerable extent remote from central stations; and to meet the needs of consumers, mostly farmers, in such districts, the builders of electrical machinery supply portable generating plants, for operation either by the power of a fall on the stream running through the property; or by some form of internal combustion engine running on gasolene, kerosene or heavy oil. The current can then be used for all kinds of farm machinery, for lighting barns and dwellings, pumping water, etc. This is of indirect benefit to industry, for besides furnishing a market for machinery, it makes the labor on the farm more effective and renders life in sparsely settled communities more desirable and better in every way.

Any reference to industrial electric power would be incomplete without at least mentioning its use in the art of communication. Present day achievements in telegraphy, telephony and radio have been made possible not only by the work of scientists and inventors, but also by the available product of factories manufacturing electrical apparatus. This work involves the turning out of machines and devices of all sizes and capacities, from the 2,500 kw generator for wireless transmission to the small, exceedingly delicate audion or vacuum tube amplifier used not only in radio work, but in long distance telephonic wire transmission as a vital part of the repeating apparatus. At least one large industrial plant has installed its own radio apparatus for communicating with its branch factories and business offices in widely separated localities.

The greater and more extended the use of electricity, the more pronounced is the influence of its incidental benefits upon the employees of mills and factories and upon the communities in which they live. Better lighting and ventilation, more sanitary work-

(*Continued on Page 32*)

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"To the executive, who would attain the fullest measure of success, "VISUALIZATION" must be a creed. He must realize that only through such "VISUALIZATION" can he be in a position to plan accurately and direct effectively." Excerpt from
"Production Control"

"To industrial executives who are interested in, and who recognize the value and importance of adequate and proper Cost Accounting methods, this booklet is submitted." Excerpt from
"Predetermined Costs"

Production Control

Contents

FOREWORD
"VISUALIZATION"
WHAT DAILY SIGNAL INFORMATION WILL ACCOMPLISH
A WORD CONCERNING FUNDAMENTALS
ESSENTIAL REQUIREMENTS FOR SUCCESS
METHODS WHICH PROVIDE DAILY SIGNAL INFORMATION
IN GENERAL
AS APPLIED TO PRODUCTION
SIGNAL CONTROL BOARDS OR CHARTS
DISPATCH STATIONS
PLANNING DEPARTMENT
CONCLUSION

Predetermined Costs

Contents

FOREWORD
THE THREE PRIME COST FACTORS
PERCENTAGE OF OVERHEAD OR BURDEN RATES
DEPARTMENTAL HOURLY RATES
ORDINARY COST METHODS DEFECTIVE IN PRINCIPLE
PREVIOUS RECORDS AS A BASIS OF COST PRE-DETERMINATION
PRE-DETERMINATION OF THE BURDEN FACTOR
USE OF OPERATING EXPENSE BUDGETS
PRE-DETERMINATION OF THE LABOR FACTOR
PRE-DETERMINATION OF THE MATERIAL FACTOR
STORES AND STOCK CONTROL
CONCLUSION

These booklets are a compilation of suggestions, to aid in analyzing problems and to assist in the checking of plans for their solution with the proven advantages in procedure and methods developed in our thirty years of experience in assisting hundreds of enterprises to greater production and greater profits.

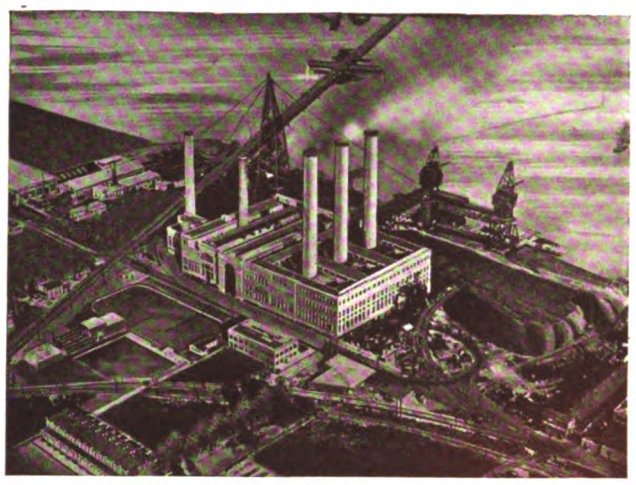
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McCall, Brownell & Co., Inc.

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Industrial Engineers **Organization Specialists** **Analytical Accountants**

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Consolidated Gas, Electric Light and Power Co.
36 Copes Regulators on 36—1000 H. P. EdgeMoor Boilers

Not Only In Central Stations

IT is true that 98% of the leading Central Stations in the United States use COPES FEED WATER REGULATORS. And Central Station boiler plant management is usually very efficient.

But that doesn't mean that the COPES REGULATOR is a proposition only for the Central Station or for the *exceptional* plant. On the contrary, many of the largest plants, such as the Youngstown Sheet & Tube Co., Ford Motor Company Plants, and scores of small plants, on boilers as small as 10 h. p., use the

COPES FEED WATER REGULATOR

because of the demonstrated economy and accuracy of its regulation under every conceivable service.

Unlike any other regulator, the COPES water level can be raised or lowered without taking the load off the boiler, without disturbing the piping, and without opening or closing any valves—by a simple wrench adjustment. At the same time, the COPES indicates the opening of the valve at all times, enabling the water tender to check against water level.

Most important of all, the savings due to proper feed-water control are obtainable without feed-line changes and at very small expense—the COPES REGULATOR being inexpensive to install, while the maintenance cost is almost nothing.

A list of users in your industry or in your locality will be furnished on request

NORTHERN EQUIPMENT CO.
101 West 11TH Street . . . Erie, Penn.
Branch Plants: Hamilton, Ont., Canada; Manchester, England; Paris, France; Cologne, Germany

(Continued from Page 30)

rooms, cleaner shops due to the absence of belting, ease of manipulation of machinery and lessened liability to accident constitute some of the benefits that the introduction of electric power has brought about.

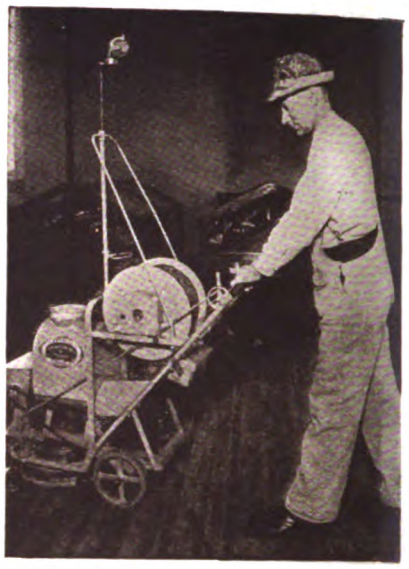
If one may regard railroad operation as a branch industry, the benefits obtained by adopting electric energy are increasingly noteworthy. The financial aspect of railroad electrification is a deterrent to its progress; but wherever the change from steam to electric power has been made, experience shows that the expenditure has been justified. Moreover, the question is intimately associated with water power development. For example, the Chicago, Milwaukee & St. Paul Railway would not have electrified its main line over



Quasi-Arc Welding Outfit, for use in electric welding.

the mountains of Montana and Idaho and its Pacific Coast extension had it not been able to secure energy through the Great Falls, Mont. water power.

California has overcome the lack of coal within its boundaries by many magnificent developments of the state's water powers. In one installation, the energy is distributed almost 250 miles to the points of utilization. Moreover, the engineers of the Big Creek, Cal. development have just installed transformers, switches and line insulators of a character capable of successfully withstanding the transmission pressure of 220,000 volts! This will soon be the regular voltage of the system.



Electric floor-scrubbing machine which does the work of a dozen men.

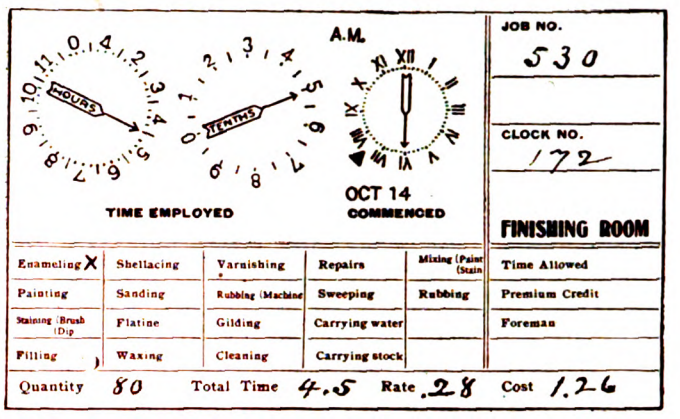
Water power development is only beginning in the United States. We have not realized or felt the need of considering it except in special cases, like that just mentioned. But, in order to supply the needs of industrial centers and municipalities, we have in recent times built many large generating stations operated by steam and consuming annually millions of tons of coal. A few of these stations have been located as near coal mines as other conditions, such as the distribution of the energy, amount of condensing water available, etc., would permit. Most of them, however, especially in or near large cities are dependent for their coal supply upon a long railroad haul, likely to be interrupted by periods of bad weather, strikes and other unforeseen circumstances. The transportation of coal from mines to generating stations is a wasteful practice, because it necessitates the use of cars and locomotives representing in the aggregate a large amount of capital. What is equally inefficient, the empty cars must be hauled back to the mines by locomotives burning coal solely for this duty and for every round trip of such a train, the labor of a considerable number of men is required.

Statistics compiled by Electrical World show that during the month of October, 1920, the average *daily* output of central generating stations representing 78 percent of the installed rating of the United States amounted to 126,000,000 kilowatt hours. These figures are for both steam and water power stations, as well as for those

(Continued on Page 36)

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Records elapsed time right on the job ticket

HOW long would the average mechanic in your shop take to do this simple sum?

"A machinist started job on milling machine at 8:21 a. m., stopped for lunch at 12:02. Began again at 12:37, finished at 2:10. How much time should be charged on this job?"

He would take several minutes, anyhow, and the chance of error is great. Yet high-priced mechanics are wasting productive time on just such figuring, in every shop where they still use the old style job-ticket to show elapsed time.

The Calculagraph shows at a glance time started, time stopped, and the *elapsed time*, right on the job-ticket. Wherever elapsed time is a factor---in a big factory or small shop---the Calculagraph quickly pays for itself as a saver of time and money.

The Calculagraph way

One backward-forward movement of the right-hand Calculagraph lever when the job starts, a pull on the left-hand lever when the job is done, and the time record is *complete*.

The *elapsed time* can be read directly from the card, without any figuring or possibility of error.

The above complete Calculagraph record shows that the workman began enameling on job No. 530 at 7:30 a. m., Oct. 14, and that the operation took four hours and 5 tenths minutes, (hours and minutes printed if preferred). No time-wasting figuring was necessary, no possibility of error existed, and it was impossible to falsify the record.

Any number of employees can use one Calculagraph without confusion of records.

Send for booklet "Elapsed Time Records," and sample cards

THE CALCULAGRAPH
THE ELAPSED TIME RECORDER

34 Church St., New York City

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Are You Thinking Beyond Your Job?

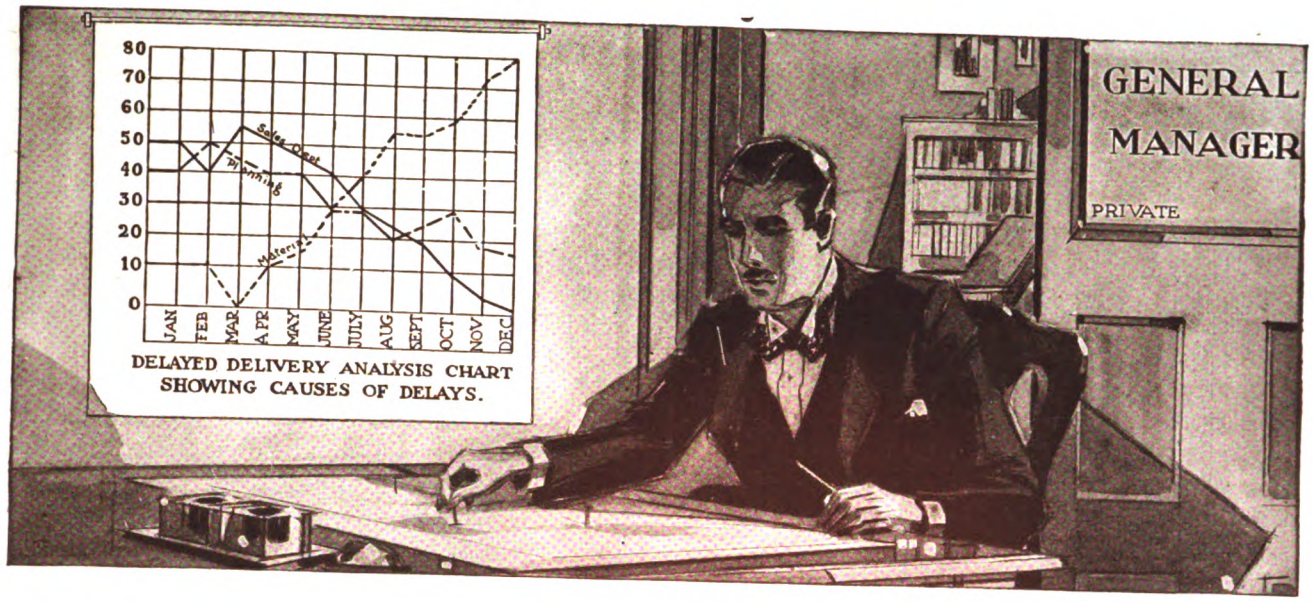
1921 has gone. 1922 needs trained men. 300,000 factories are calling for executives. Where will YOU be a year from now?

INDUSTRIAL EXTENSION INSTITUTE,

9 East 45th Street, New York City

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300,000 Jobs Like This Are Waiting

You can have one if you have the ambition. If you are content to plug along on a moderate salary, doing routine work until you are fifty—don't read any further. This message is for real men. Live thinkers. Men who want to DO things—not to BE TOLD to do them.

Listen then, you men who do not want to stay in a rut. If you want to get up higher where the atmosphere is clearer—where you can use vision, where you can get some of the real joy of directing men—where you can command a salary which will give you these things which you envy the other fellow for now. Listen—for industry is calling you. Here is your big field—industrial engineering. It offers you the finest chance for quick and substantial reward, if you are willing to spend a little time and a little money on yourself.

Every manufacturing company in the country wants men who understand how to get economical production. The old wasteful methods must go. Men are wanted who know what to do—there is no place for guessers.

President Harding, Secy. Hoover, every engineer of prominence, every publication of importance—has stated the fact—

PRODUCTION MUST INCREASE, THE WASTE IN INDUSTRY MUST BE ELIMINATED, PRICES MUST COME DOWN.

It is not a call for machinery—not a call for material—but it is a call for trained men, for men who understand the control and operation of men—methods, material and equipment—who have the knowledge which enables them to direct a manufacturing organization toward sound and economical production.

This is your opportunity. Do you want it? Have you got the common sense—that's plain English—to train yourself for a big job like this? What does it mean to you? To your family? To your future?

The Industrial Extension Institute has been telling its message to men like you for five years. The Institute knows that mere curiosity or indifferent interest, are not worth the time and effort to stimulate. But if the opportunity to do bigger things—in a bigger way—means anything to you—if production work attracts you—then we invite you to fill in the coupon below.

It will bring to you our booklet "Thinking Beyond Your Job," which tells you about the Factory Management Course and Service. This is a practical course of home study and reading, with practical field problems, prepared by sixty-three men who are recognized leaders in the industrial world. These men—Steinmetz—Knoeppel—Babson—Towne—Myers—Ficker—Gantt, etc., have put into the Course the essence of their many years of experience in the industrial field. Think what it means to you to get this training as *your starting point.*

SIGN THE COUPON. MAIL IT TODAY.

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Please send to me without obligation your free booklet "Thinking Beyond Your Job."

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(Ind. Illus., Jan., 1922)

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How Can —

Compute Time Studies-Set Piece Work Rates-Find Accurate Costs-Locate Waste Motion?

Time Study men, production managers, superintendents, foremen—now you can know how to compute time studies of any job, set piece work rates, locate cost leaks. The experience of trained time study engineers, gained through years of research is at your service in a direct usable form—specifically applied to your work.

It may be an operation in the soap industry the building of a railway locomotive, a job in the ordinary machine shop or in the textile mill—our courses in "Time and Motive Study" give you definite formulas, complete and detailed directions. These courses have been resolved into their simplest forms—there are no intricate charts, no higher mathematics involved. Take them right into your shop, use them with your time study watch, and do all the work yourself. No outside expert assistance needed.

A Big Demand for Trained Time Study Men

Never before has the man trained in the factory been able to apply time studies to his particular work without an immense amount of labor and experiment. Yet the demand for trained time study men is growing every day. Write us for all the details of the "Time and Motion Study" courses. Tell us the type of work you are doing, the product you make, your position with the company. Each letter receives our personal attention.

Write Us Today for Details

THE TAYLOR INSTITUTE

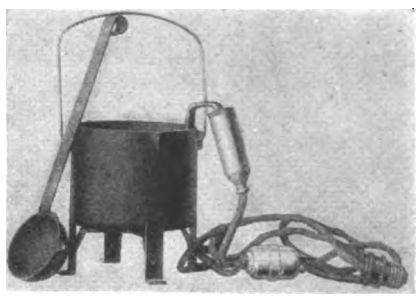
122 South Michigan Ave. Chicago, Ill.



(Continued from Page 32)

using water power in certain seasons of the year and having a steam stand-by plant to help out through periods of low water. The estimate does not apply to the stations generating electricity in strictly industrial plants. The amount of coal consumed by all these various stations is in the aggregate, appalling.

Two plans are proposed that should bring considerable relief to this situation. In 1920, Congress enacted a law creating a national Water Power Commission and defining very clearly the conditions under which individuals or corporations might develop the available power of the streams and rivers of the



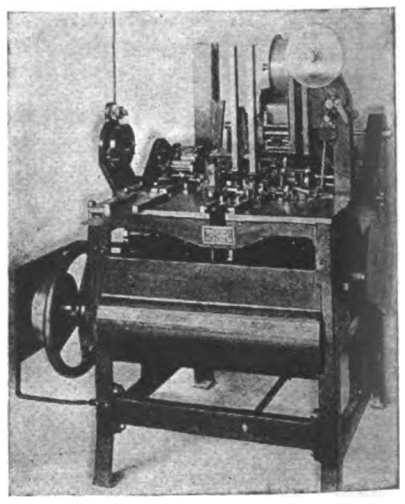
Westinghouse Electric Solder Pot.

United States. These power sites are to be leased for a period of fifty years, after which, with due compensation to the lessees, they revert to the United States. Already a large number of applications for permits have been filed with the Commission and in a few cases, work has been started. There is an immense amount of available hydraulic energy undeveloped, and it is fervently hoped that the next ten years will witness a great change in the proportion of the numbers of steam to water power electric plants.

Another plan, known as the Super Power Scheme, has for its object the inter-connection of all large generating stations, both steam and hydro in the district between Boston, Mass. and Washington, D. C., extending back about one hundred and fifty miles from the Coast for the purpose of generating all power in the largest and most efficient stations. Some new stations will be built, others, too small or incorrectly located, will be abandoned; but circuits will be so arranged and connected that wherever, in this intensively developed industrial district there is maximum need for power, it may be supplied from, if necessary, several stations in the district. Engineers have estimated that the electrification of the railroads in the Super Power Zone would effect a saving of 10,000,000 tons of coal per annum because of the lower cost of producing power in large, modern stations.

Naturally, as to either of these propositions, their financing looms up as a serious difficulty; but the engineers and business men whose minds are now concentrated on the problem feel confident that this difficulty will be overcome in the not distant future.

In addition to water power development for electric generating stations, another possibility opens up, and that is the use of internal combustion engines operating on the gas produced in by-product coke ovens. Experience gained during and since the war has shown the great possibilities within reach by the general use of by-product gas. Even in times of peace, there is a wide market for coal by-products, coke and gas. The energy of coal is far more fully utilized by coking it and employing the gas to run an engine and electric generator than by burning it under boilers to make steam for even the most efficient steam turbo-generator. It is expected by far-seeing engineers that this will be at least one solution of the difficulty of securing cheap power for industrial use. If it can be generally carried out, there will be a new day in industry and a better outlook for industrial workers.



Chewing-gum wrapping and sealing machine made by the Package Machinery Co.

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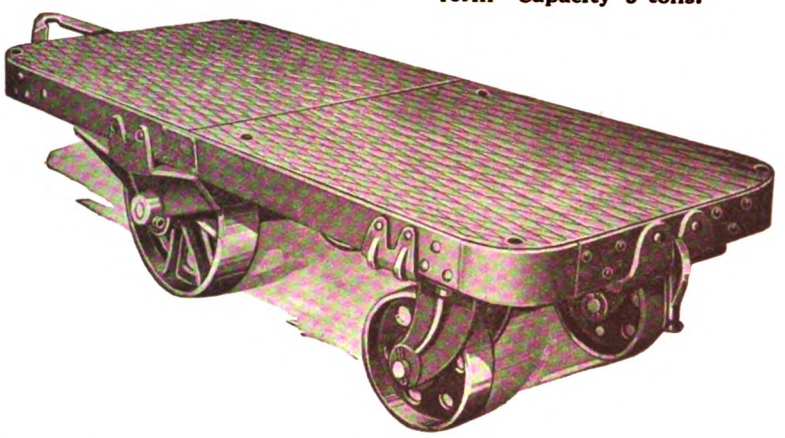


Many classes of industrial wheeled equipment are made by the K. & J. organization

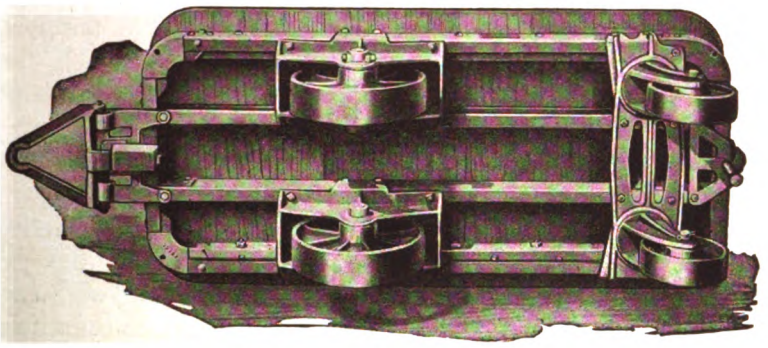
"K. & J." Railess Car Equipment

For Storage Battery Tractor Systems

"K. & J." Industrial Trailers, Fig. 419 with Steel Plate Platform—Capacity 3 tons.



Using, with a tractor, trucks primarily designed for man propulsion is in most cases an expensive and wasteful practice.



Inverted View, 418—with wooden plat form
Fig. 418 is the same as Fig. 419 except platform construction

Trailers shown above are of the "K. & J." Standard Heavy Service Type for foundries and all metal and clay working industries; also for the heavier warehouse, freight house and dock service.

This type is supplied with either removable steel plate platform. or with wooden platform.
Also supplied with semi-automatic coupler or with common Y coupling, as ordered.

Rear wheels roller bearing. Roller bearing castor stem turning in vertical rolling bearings. Castor swivel ring bearing.

Frame dimensions 72x30x16¾ high. Approximate weights, with wood platform, 725 pounds, with steel platform, 750 pounds.

We also supply standard trailers in one and two ton capacities. If your requirements necessarily are for a special type of trailer we are prepared to design and build these in quantity very economically.

A well designed trailer is little brother to the freight car. It must be designed to handle tonnages rather than hundredweight.

Good trailer equipment must withstand the stresses formerly encountered only in small car service plus runway impacts of a much more severe character.

The greater tractive effort ordinarily required to move "non-railed" trailer equipment must be reduced by proper running gear design.

The thrusts and impacts to running gear incident to handling heavier loads must be well provided against by trailer design.

Good tracking of trailers, one with the other and with the tractors, must be afforded if trailers are to be speedily and easily handled on curves and safely handled on narrow loading platforms.

Adequate beam for the support of heavy loads under all conditions and rigid, rack-resisting frame connections must be embodied.

Quick, easily operated coupling attachments must be devised and supplied.

All of these points and more are fully taken care of in "K. & J." Trailer Equipment.

For further information write for our Bulletin

HYATT ROLLER BEARINGS INCLUDED IN STANDARD EQUIPMENT

The Kilbourne & Jacobs Mfg. Co.



Columbus, Ohio, U. S. A.

New York, 120 Broadway

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"Our Daily Bread"

(Continued from Page 13)

temperature and humidity of the mixing room are carefully regulated in accordance with what experience has shown to be the best conditions for proper setting of the dough.

Each trough in turn, as it is ready, is wheeled to a trap-door in the floor. The end of the trough is opened, and the entire thousand pounds of dough is pushed down the chute to a hopper on the floor below.

From this hopper, the dough is fed to an ingenious machine which cuts and delivers (six at a time) the proper amount of dough for a standard loaf of bread. These embryo loaves are rolled in a shaping machine, automatically dusted with flour, and pass onto a moving belt. They travel along this belt for eleven minutes (because that is the proper length of time for air-drying), and finally drop down another chute to the baking-pans.

As the pans are filled, they are set in racks. These are then wheeled into the steam room—a room kept at even heat by steam coils—where the dough rises to its proper height. This takes about an hour. The racks are then wheeled to the oven, where baker and helper push the pans into the oven at incredible speed.

The ovens are gas-fired, and are kept at a temperature of about 550°—each batch of bread requiring about three-quarters of an hour to bake to the accepted golden brownness.

After baking, the loaves are tapped out of the pans onto a belt conveyor which takes them to an automatic elevator. They pass in review, as it were, before inspectors who lay aside those which don't meet the standard. The accepted loaves then pass on to a wrapping machine, which with three simple motions wraps and seals them in waxed paper. The average daily output of bread at this plant—incidentally, this is the well-known "Bond Bread," whose manufacture we have been describing—is about 50,000 large loaves of 24 ounces, and about 20,000 small or 16-ounce loaves.

Perhaps our Lady of Color would sniff at the new-fangled notion of weighing the ingredients and measuring the temperature and the time. But she would certainly have to admit that the modern way turns out more bread in a given time with a fraction of the labor. And we suspect that, if she were blindfolded, she'd have a mighty hard time to distinguish between her own product and the bread made in "one of dese here factories."



Everything You Need— At Your Finger—Tips

A generation or so ago, desks were called "Secretaries." And that is exactly what a desk should be—a secretary to take care of the records and essential tools used in connection with your work.

Too many office desks are mere repositories of junk; their very design making it impossible to care properly for essential papers and records which must be instantly available. It was the knowledge of this fact, that led to our extensive research into the real utility of and purposes of desks.

The "Y and E" Efficiency Desk

REG. U.S. PAT. OFF.



is the combined result of this exhaustive research together with our forty years' experience in building desks and filing systems.

Built in six distinct models, each with a variety of possible combinations in the way of drawer equipment, among them is exactly the right desk for YOU. An *individual* desk, designed and equipped so that every record, every document—and, of course, pencils, paper, and so on—is right where you can lay your hands on it instantly, without interrupting your train of thought.

Irrespective of whether or not you need a desk, you will find the booklet "The Executive's Workshop" a veritable mine of information on planning the day's work, arranging the office equipment, and so on. Your copy will be sent on request, without cost or obligation.

YAWMAN AND ERBE MFG. CO.

143 St. Paul Street, ROCHESTER, N. Y.

Branches and Agents in all principal cities.

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The Yardstick

Four essentials of a good advertisement

"THE YARDSTICK" is a small booklet which we are glad to send on request.

There is but little advertising which cannot be improved by comparing it with the four essentials described in "THE YARDSTICK."

Wales Advertising Co.
141 West 36th Street **New York**

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EXPORT - IMPORT - FINANCING

THE present exchange situation offers exceptional opportunities for American concerns of all kinds. We have exported from and imported into the United States tens of thousands of tons of raw products and finished goods. We are equipped by experience and fully organized to attend to all the details of your foreign trade requirements, including the financing of same. Our connections with leading banks in all important European countries enables us to attend to remittances in all exchanges and to the cashing of coupons. We are in a position to advise you, both on the market for exports and on the materials and products which can be imported to advantage.

Northern & Western Finance & Trading Corporation

7 Hanover Street **New York, N. Y.**

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Building Roads of Coral

(Continued from Page 24)

The roads that lead through Southern Florida are a story by themselves. A long story—serial one might say, for seven hundred miles of them stretch like the fronds of a palm from Miami and Biscayne Bay, and one may follow this trail to the sound of the booming ocean; through Coral Villas, and kindred populous new suburbs of Miami; along palm-bordered motor drives, or past 11,000 acres of richly-producing farm land where the Curtiss-Bright ranch demonstrates what can be done with the rich soil gained by government enterprise.

Perhaps it may truthfully be said that Miami is the only township which has not had to sweat over its roads. Nowhere else in this country can perfect roads be produced as cheaply and with as little effort as in this section of Florida. A colony of little coral polyps settled this question long before Columbus discovered America.

Florida is like a gorgeously embroidered mantle thrown over a vast walled city built of coral. Millions of tiny workers laid their structure in beds of soft coral—oolithic limestone, to be exact, and quarrying this stone is child's play compared with handling the composition for any other type of roadbed.

All Miami roads are built for commercial vehicles and the only thing that city buys for its highways is oil. Dade County roads are rock roads with an asphalt surface, and its people proudly show that Fifth Avenue, in New York, owns nothing better.

Inexpensive material of the peculiar nature of oolithic limestone accounts for the low cost of road-building, fences, coral dwellings, bungalows and picturesque Spanish gateways made of this attractive structural medium.

Only a little depth below the surface, in Dade County, coral rock is quite soft and easily quarried and crushed for roads and sidewalks, or cut into blocks of desired sizes for building purposes. After the rock has been exposed to the air it rapidly hardens so that it has been a simple matter to construct a roadbed, sprinkle sand over its surface, and then add layers of oil and fine sand.

When such a road has been allowed to harden it becomes a rock highway of the finest quality, and is very smooth and easy for riding. Most of the roads in residential sections of Miami, such as the eighteen or twenty miles of streets and drives built by the Montray Company, and the Tamiami Trail along the Curtiss-Bright ranches, are constructed by property owners and then are taken over and maintained by the county.

Ease and cheapness of construction, then, account for the rapidity with which roads have stretched their smooth trails through Florida's tropical beauty, and Spanish-looking villas of white stone, spring up like fields of lilies gleaming amid evergreen palms and crimson royal poinciannas.

Just as every milestone is a signboard of progress, so every road which pushes its way into untrodden fields fringes its borders with the home-fires and fruitful fields of civilization.

CORRUGATED WIRE GLASS

MAXIMUM LIGHT and STRENGTH
combined in
CORRUGATED WIRE GLASS
for all kinds of buildings
(old and new)
NO STEEL SASH REQUIRED

C.W.G. used in ROOFS, SKYLIGHTS, SIDEWALLS, CANOPIES, MARQUISES, OVER AREAS, and wherever DAYLIGHT IS ESSENTIAL.
Used alone, or with other corrugated materials.

GLARE and SHADOW REDUCED TO MINIMUM
C.W.G. WON'T BREAK FROM CONTRACTION & EXPANSION
(each joint an expansion joint)

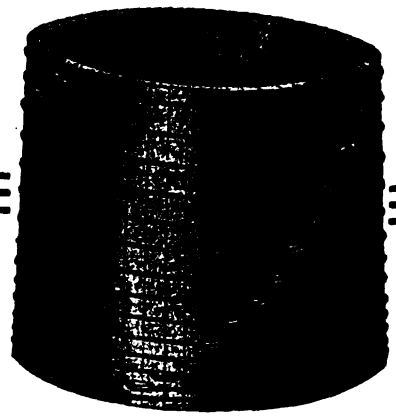
C.W.G. withstands severe tests when used in such buildings as PRODUCER & BOILER HOUSES where conditions on inside and outside are so very different.

SUBMIT YOUR PROBLEMS TO OUR ENGINEERS,
who will advise you without any obligation.

SEND FOR CATALOG NO. 7-C

Pennsylvania Wire Glass Co.
PENNSYLVANIA BUILDING
PHILADELPHIA, PA.

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Tight and Leakproof

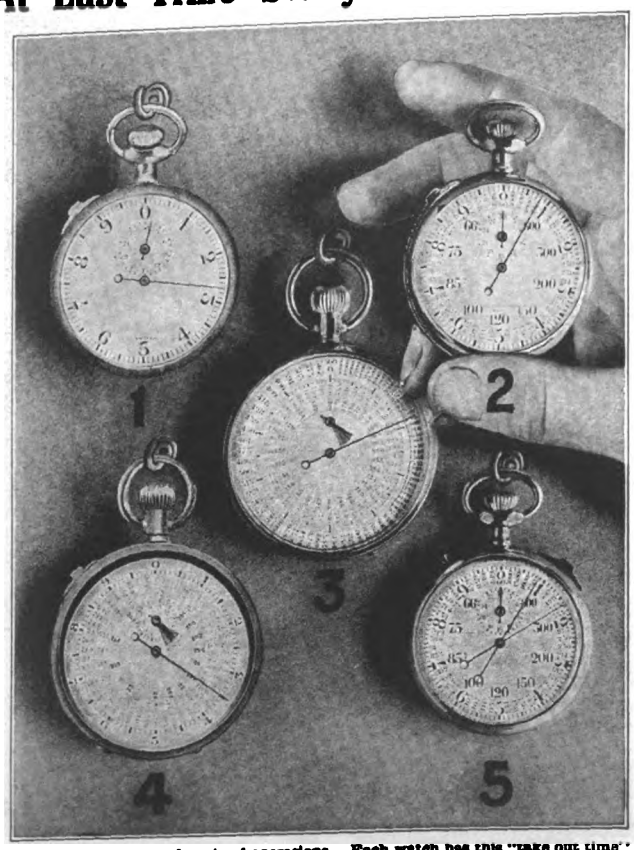
Of approved construction, machine-planed joints, hoops of proper size and number and with a positive grip; these are some of the reasons why Caldwell Cypress Tanks cannot bulge, break or leak. Caldwell Tanks are built by men who have been making superior tanks for over 30 years. Tanks of all sizes for all purposes.

Send for Catalogue

W. E. CALDWELL CO.
INCORPORATED
2200 BROOK ST. LOUISVILLE, KY.

Caldwell TANKS AND TOWERS

At Last Time Study Watches for Every Job



of multiple operations and parts of operations. Each watch has this "take out time" feature.

At last time study watches have been developed to where they can apply to every job in the plant—do their own calculating for production figures—give you direct results with absolute accuracy. Your job may be a simple time analysis—or a complex problem in piece work rate setting or a bonus system—there's a watch in this illustration that exactly fits your needs.

For Locating Wastes
Computing Costs
Setting Rates for Piece Work
Establishing Bonus Plans

You can use any one of these watches for every kind of time study. But each has special features that facilitate certain types of work. No. 1 has a plain decimal dial with the "take out time" feature. No. 2 has, in addition, direct readings in production per hour up to 1 minute jobs. No. 3 carries the same readings up to 5 minute jobs, in seconds and half-seconds. No. 4 gives all readings in decimals and shows production figures up to 3 minute jobs with a special arrangement for timing jobs up to 30 minutes. No. 5 is the "split hand" watch with the "take out time" improvement which now permits careful studies feature.

Any Watch Sent on Approval to Responsible Concerns

Pick the watch that fits your job. We will gladly send it with a descriptive pamphlet on its use to any responsible concern on approval. Put it to any test you wish—prove its advantages in facilitating the work and guaranteeing absolute accuracy. Each watch is backed by our unlimited guarantee. Write us today for the instrument that fits your requirements—or in case you desire our advice, tell us the class of work you are doing and we will ship you the watch to meet your needs. No obligation. Write today for detailed pamphlets, or for pamphlet entitled "More Jobs for the Factory Stop Watch."

MORTIMER J. SILBERBERG CO.

Peoples Gas Bldg. Pioneers in Manufacture and Sale of Time Study Watches **Chicago, Illinois**

Routing Work Through a Big Plant

(*Continued from Page 17*)

We do the necessary repairing in our electrical dept. and a small amount of repair parts that are needed for the Automatic Transportation and the Elwell-Parker trucks are carried in stock, such as, Controller Fingers, Lift springs and resistance coils, the repairs have not been worth mentioning, for any of the trucks, hand or the electric. We offer no incentive, other than the regular wage and weekly attendance bonus to the operators. These truck operators are in charge of a foreman, who directs deliveries, checks up handling methods, proper care in handling, proper placing. The department foremen interest themselves to instruct their

(*Continued on Page 44*)

1 THIS JOB WILL BE IN YOUR DEPARTMENT NEXT

Symbol No. 9MC 6A-1 A | Name HEAD - STYLE F | Lot No. 7395

Orig. Amt. on Ticket 10 | Material MAY 25 1921 | A. M. | P. M.

Dep. Mch. No.	7	10	8	35	9	
IN Date Dept.	5-25	5-27	6-3	6-7	6-10	
OUT Date Dept.	5-27	6-3	6-7	6-9	6-15	
Mch. No.						
Dep. Mch. No.	8	11	17			
IN Date Dept.	6-15	6-20	6-25			
OUT Date Dept.	6-20	6-25				
Mch. No.						
Dep. Mch. No.						
IN Date Dept.						
OUT Date Dept.						
Mch. No.						

Cabinet A. M. P. M. | Drawer | Shop No. A. M. P. M.

2 6A-1 **LOT** 7395

Symbol No. 9MC A Shop No. 1426

Name HEAD - STYLE F

Original Amt. on Ticket 10 | No. Pieces to make Req. Amt. | Material C.I.

Cost. Dept.

Machine #9 MULTI-CUT Unit HEAD

Foundry Weight Each One Total

Lbs. Run Ft. Rough DIA Size DIA LEN

Balance on Hand, Pcs. Lbs. R. Ft.

Price Each Per Lb. TOTAL COST

Signed Date in Plant

3 Date Sched. to Start 5-25 **LOT** 7395

Foundry Aisle Sec. Row Bin Bal.

Held for Order

Symbol No. 9MC 6A-1 A Date in Plant Shop No. 1426

Name HEAD - STYLE F

Original Amt. on Ticket 10 | No. Pieces to make Req. Amt. | Material C.I.

Cost. Dept.

Machine #9 MULTI-CUT Unit HEAD

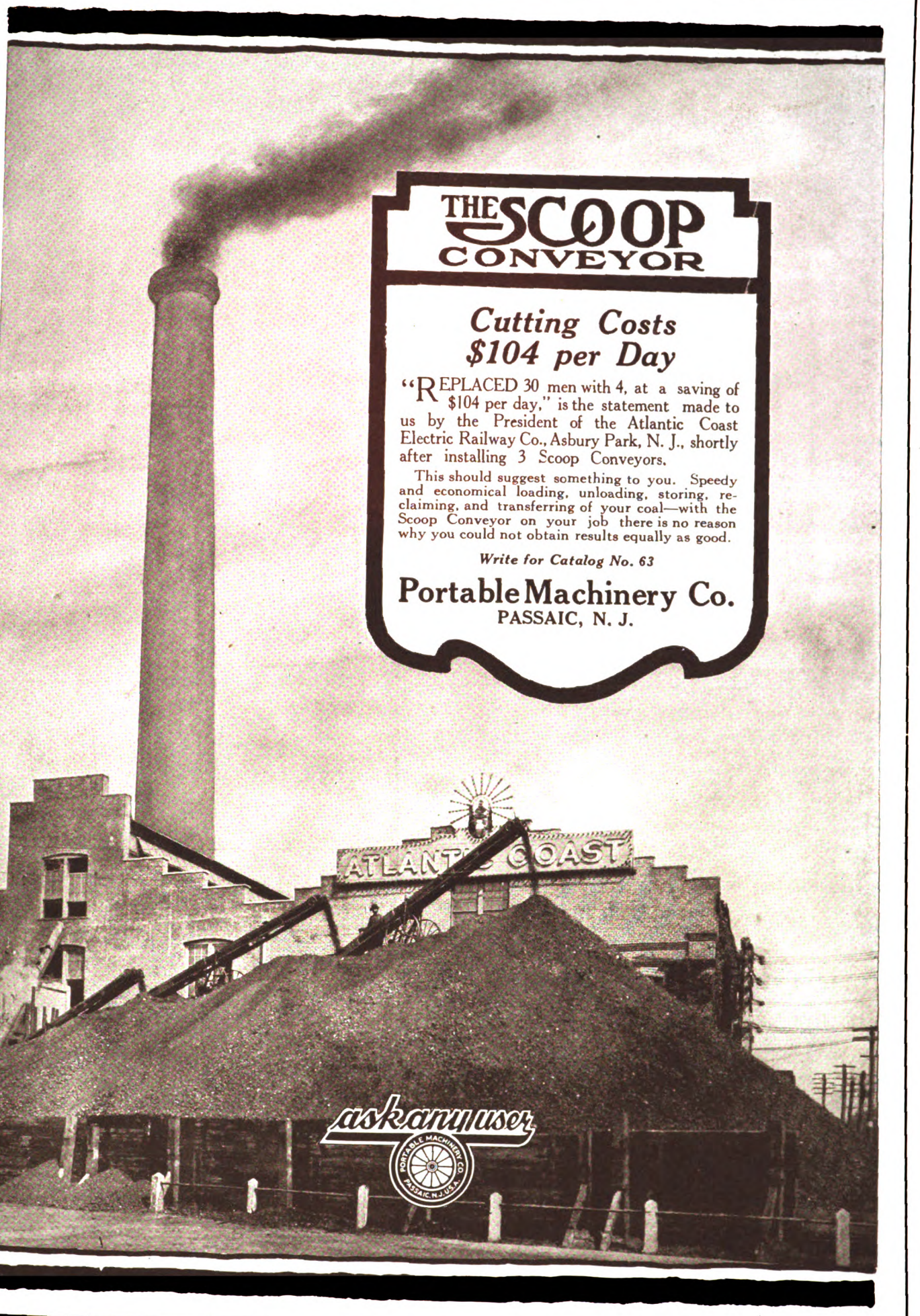
FROM DEPT.	OPER. NUMBER	AMOUNT ON TICKET	SPOILED	MATERIAL DEFECTIVE	AMOUNT GOOD	INSPECTOR
					LOT	7395

INSPECTOR MUST SEE THAT THE AMOUNT ON THE TICKET AGREES AT ALL TIMES, WITH THE AMOUNT IN THE LOT WHETHER PIECES OR PAIRS.

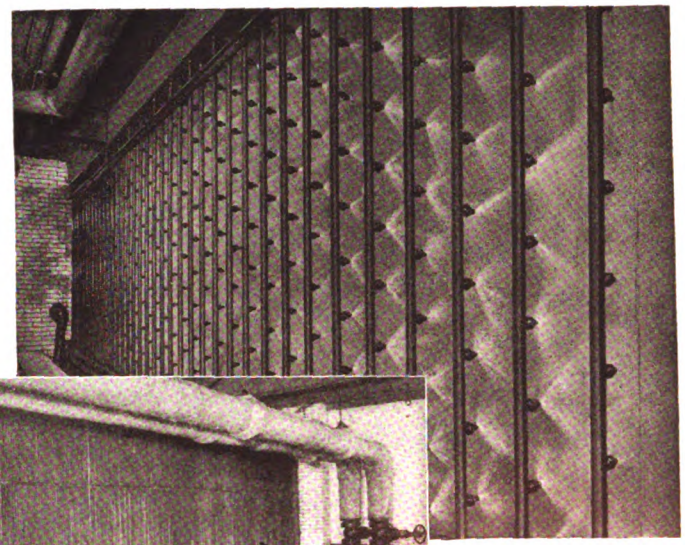
NAME OF OPERATION	DEPT. NO.	JIG NO.

Job ticket used to route work through the Le Blond works. See page 44 for cut of blue print which is attached to this ticket.

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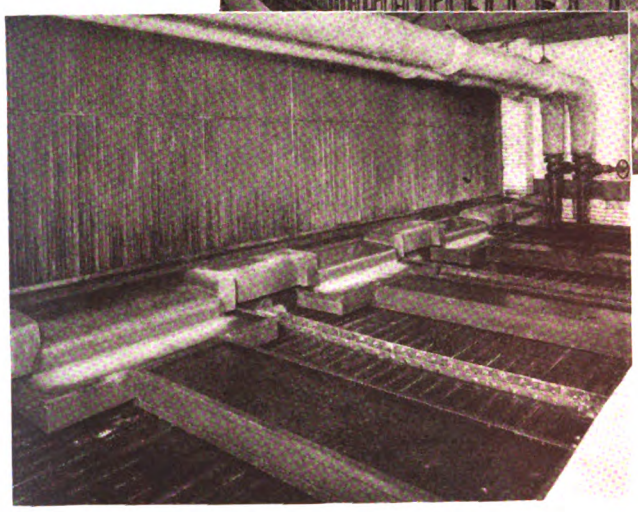


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SPRAY CHAMBER OF AIR WASHER

To the left are the primary tempering heaters, to warm the entering fresh air above freezing. The air passes the nozzles from left to right. The spray chamber is 30 feet long.



ELIMINATORS, DISTRIBUTORS AND BAUDELOT COILS

The air, having been washed and otherwise conditioned at the spray chamber, passes through the eliminators shown at the left, on its way to the fan. In winter, ordinarily it is unnecessary to cool the spray water, but it is necessary to warm it, and under such conditions no water flows over the four weirs shown here, and the refrigeration is shut off. In summer, however, the water must be chilled, by contact with brine coils. It flows downward in droplets over the cold pipes, from the distributors shown in the center.

A REMARKABLE AIR CONDITIONING INSTALLATION

In the Union Stock Yards at Chicago is a large General Office Building of a prominent Meat Packer located in the very midst of a district where dust, dirt and odors from cattle pens and fertilizer works is most objectionable.

Where the extremes of temperature and general climatic conditions seriously affect human efficiency.

Send for copy of this Pamphlet

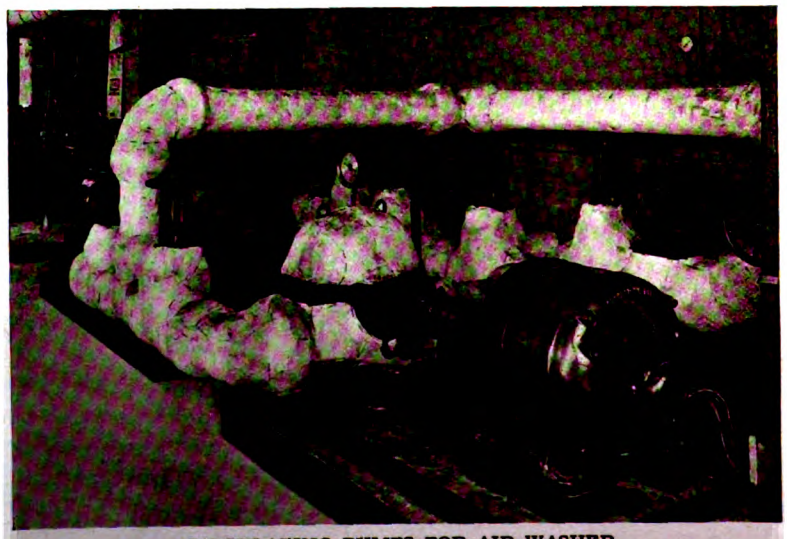
In 1917 this entire five story building 94 feet wide and 200 feet long was equipped with a modern ventilating system including a Webster Dehumidifier by which air conditioning is accomplished in such a remarkable way that it has become one of the show places in the yards.

In an article written by the Consulting Engineer who designed and superintended this installation he not only describes the equipment and method of installation but tells of the advantages gained by its use and states that during the summer of 1918 the inside temperature was easily maintained at 79°F. when the out-door temperature was 102°F.

A copy of this illustrated article reprinted in pamphlet form will be sent to those nterested by writing to the Manufacturers of the Dehumidifying apparatus.

Atmospheric Conditioning Corporation

469 Chestnut Street, PHILADELPHIA



CIRCULATING PUMPS FOR AIR WASHER

These 6-in. pumps are in duplicate so that one always is in reserve, and are used to force the water through the sprays.

(*Continued from Page 42*)

men, so as to lessen damage, and in this close relationship our one object always and still is, Successful Handling and to Transport details as governed by the Planning Dept. These 5 Electric Trucks are equipped with Edison Batteries of 10 year guarantee, record inspection frequently by the representative of the Edison Laboratories, they have never given us any trouble since their installation they are given daily attention by our electricians. Our Charging Station will accommodate 6 Trucks daily for charging. It was made by the Automatic Electric Device Co.; 45 Amperes, 110 Volts. In connection, we use a Rochlitz Auto Water Still, Mfg. by the W. M. Lalor Co., Chicago, Ill. Also one Edison Filler Tank & Hose Connections.

The record from June 1919 to March 1920, transported by our truck service deducting approximately 35% for heavy castings as handled by our large cranes, are as follows, Weights given in pounds:

	Steel
June 1919	58459#
July	85140
August	117986
Sept.	117986
Oct.	150908
Nov.	151975
Dec.	129604
Jan. 1920	175357
Feb.	192172
March	217691
	Castings.
June 1919	266318
July	578612
Aug.	643893
Sept.	643893
Oct.	797412
Nov.	789174
Dec.	729110
Jan. 1920	752277
Feb.	890219
March	967520

The above is the initial handling of rough materials from our rough storage de-

(*Continued on Page 47*)

THE R.K. LeBLOND MACHINE TOOL CO.

NAME *HEAD - STYLE F* SYMBOL NO. *9-M-C-6-A-1 A*

OPERATION	DEP. NO.	JIG NO.	*ROUTING AUG-16-20*
Sand Blast	7		
RGH. & Fin. Plane Bottom & Dovetail	10	*11-Fix &*	*Gage - 2-9-M-C-6A-1/A*
Drill Co. Sink & Tap Bottom	8	*3-9-M-C-*	*6-A-1/A - Plate to Hold Head 3-9-MC 6A 1/A*
Surface Bottom	35	*2 Surface Plates - 4-9-M-C-6-A 1/A*	
Mill Side & Ends	9	*Index Mill Fix. 5-9-M-C-6-A-1/A*	
Mill Top	9	*Use Fix*	*5-9-M-C-6A 1/A*
Bore Drill Face & Tap Comp.	8	*Boring Jig*	*7-9-M-C. 6-A 1/A - Universal Angle Plate #3886*
		8-9-M-C	*6-A-1/A Gages Front & Rear Bearings*
			Aligning Reamers - 10-9-M-C-6-A 1/A
Paint	11		

Cut of blue print which is attached to job order to save duplication in filling in.

Date Ticket Issued	Del. to Enter Routing
Del. to Planning Dept.	Received
Del. to Engineering Dept.	Del. to Planning Dept.
Received	Received
Del. to Routing Desk	Days Consumed
Received	

SAVE THE DRAWING

What Good Is It If You Can't Read It?

DIRECTIONS TO FOREMEN.

When a job is returned to a department for correction the "Schedule Card" is held in the Inspection Department, and the "Returned for Correction" slip takes its place.

Before this job leaves your department the TRUCKER must have the "Schedule Card" or "Returned for Correction" with it, and when the job is delivered to a department this ticket is left on the job, but the "Schedule Card" or "Returned for Correction" slip must be put in the Schedule Box.

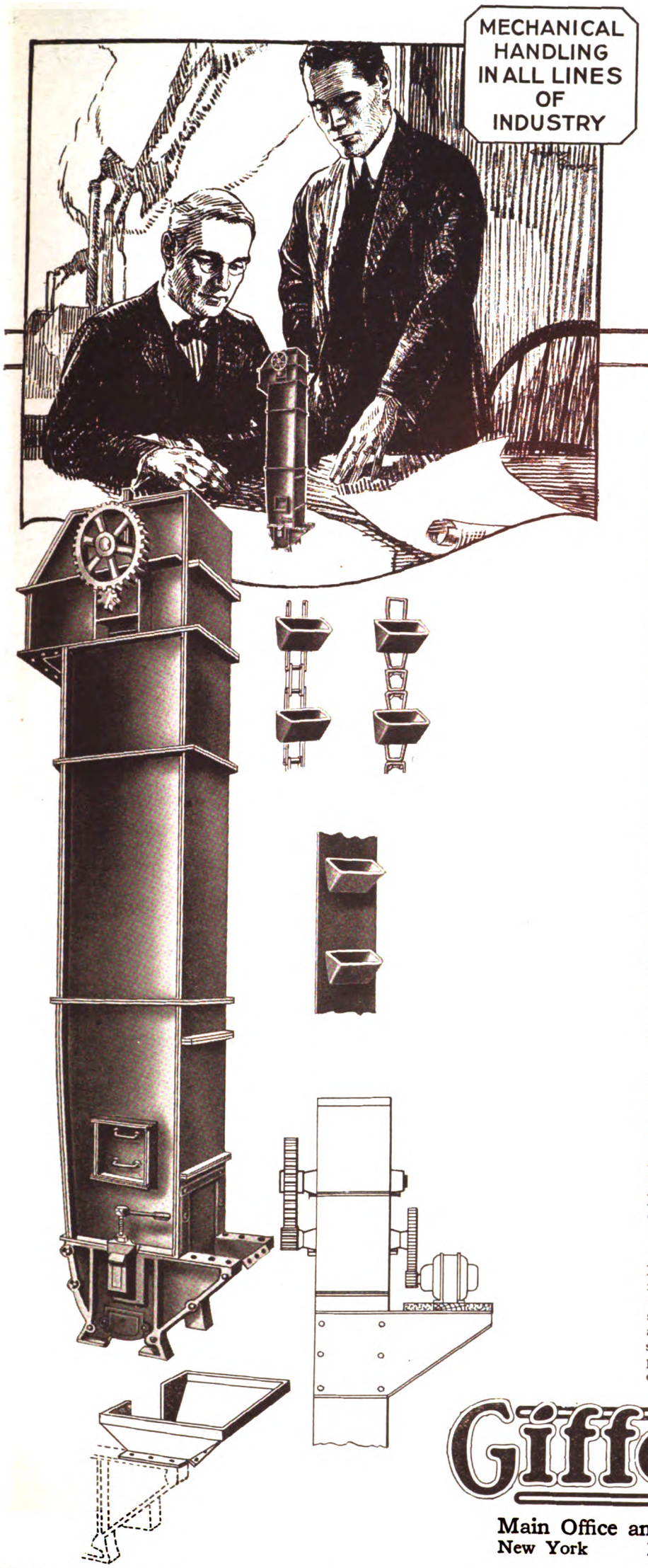
In case a job has been completed in one department, and conditions in the next department prevent its being delivered, the "Schedule Card" must be put in the Schedule Box of the next department that is to receive the job, and at the time the job is delivered the trucker will have to inquire about the missing Schedule Card.

R. K. LeBLOND M. T. CO.
Planning Dept.

FORM 4-E

Reverse side of job ticket

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"*This* standard *bucket elevator takes the* problem *out of material handling*"

About nine men out of ten think of material handling as a 'problem' —a question always involving much doubt, uncertainty, and difficulty.

To the contrary, material handling requirements are duplicated time and time again. The operating machinery required for these installations is identical. For a manufacturer such as the Gifford-Wood Company, specializing in material handling machinery and building large quantities, this situation permits ***standardization.***

Standardization means economy

This ***Standard*** Centrifugal Discharge Elevator satisfactorily meets many bulk material handling requirements. Built on a quantity production basis—of ***standard*** parts—and therefore comparatively low in cost.

A wide range of usefulness

In Power Plants—for elevating crushed coal, anthracite screenings, and ashes. In Cement Mills, Car Icing Stations, Ice Cream Plants, Chemical and Dye Works, Bleacheries, etc. Wherever crushed ice or salt, or any granular chemical has to be handled.

For handling grain in Grain Storage Plants, Grist Mills, etc. For handling sand, gravel, and crushed stone. In Foundries, Slate Crushing Plants, and wherever sand or similar material has to be handled.

In fact, the only limitations in the use of this type of elevator are: (A) The nature of the material should be such that no undesirable breakage occurs due to the contact of the material with the rapidly moving buckets (as in the case of domestic anthracite.) (B) That the particles of material are less than three inches in size and granular, so as to flow readily.
Within these limitations as to material, this type of elevator can be installed and operated at less expense than any other type.

Quick delivery—Easy to install

Standard elevator parts are carried in stock—quick delivery can therefore be made. Elevators are shipped disassembled, every part clearly marked, accompanied by complete instructions—assembly can be quickly and easily made.
Just tell us the size and kind of material you wish to handle, rate per hour at which it must be handled, height of lift, and power available. With this information,we will gladly mail you complete information, specification sheets, and prices.

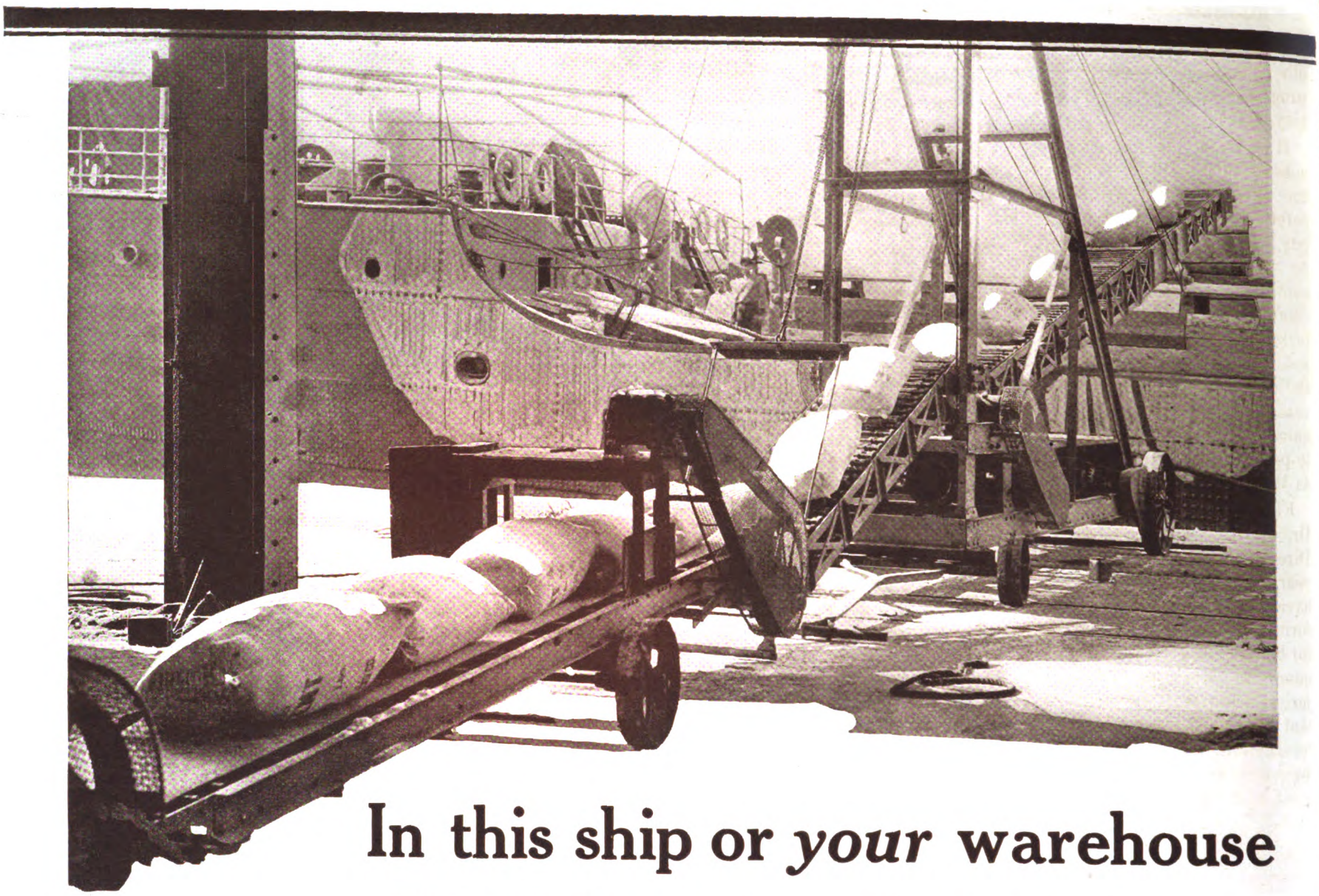
G. W. Products

For over a hundred years the Gifford-Wood Company has specialized in the manufacture of elevating and conveying machinery for all lines of industry Gifford-Wood Products include elevating and conveying machinery of all sorts for handling coal, ashes, stone, sand, gravel, ice (manufactured and natural) and other bulk materials; wagon loaders; locomotive coaling stations; pivoted bucket carriers; warehouse conveyors; car unloaders; coal pockets; screens and chutes; friction clutches; hoists; ice elevators, conveyors, and tools; gray iron castings, etc.

Gifford-Wood Co.

Main Office and Works: Second Hill, Hudson, New York
New York Buffalo Philadelphia Chicago Boston

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In this ship or *your* warehouse

This portable piler is carrying bags of flour from the piles or freight cars direct to the steamship hatches.

This, or one built for your more specific purpose, would pile your goods in your warehouses or deliver them to the freight cars.

This automatic piler handles three times as much flour as could be handled by man power without the piler. The cost with the machine is a small fraction of the cost by stevedoring methods. Damage to the bags of flour is eliminated.

The control of the loading speed is put upon the automatic machine, which never grows tired, never idles, never soldiers on the job, and, if set for a given quantity an hour, delivers that quantity.

Mechanical conveying systems, automatically controlled production, might change *your* methods with great profit to you. A Lamson engineer will gladly come and give you definite plans and suggestions for applying a modern merchandise-handling system in your business.

LAMSON SERVICE

THE LAMSON COMPANY
100 BOYLSTON ST., BOSTON, MASS.
Branches Everywhere

Lamson Conveyors

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(*Continued from Page 44*)

partment, and *does not include* other handlings as the work progresses through the factory.

It is important to select a substantial platform: one that the men can depend on for safety; that will carry a capacity load if necessary; that can be handled easily and moved conveniently. The R. K. LeBlond Co., designed as well as manufactured the platforms used in their plant, that are shown in photos; also separate units so they could be built up quickly to the necessary height, to protect the workmen as well as the work.

I have been informed by our Dr. Sanford DeHart, Medical Director, that during the three years' operation no injuries have resulted from the platform's varied use. As the doctor has a complete record of all minor as well as major injuries, I am well pleased with that record, since it shows the forethought given to both design and use from the standpoint of safety.

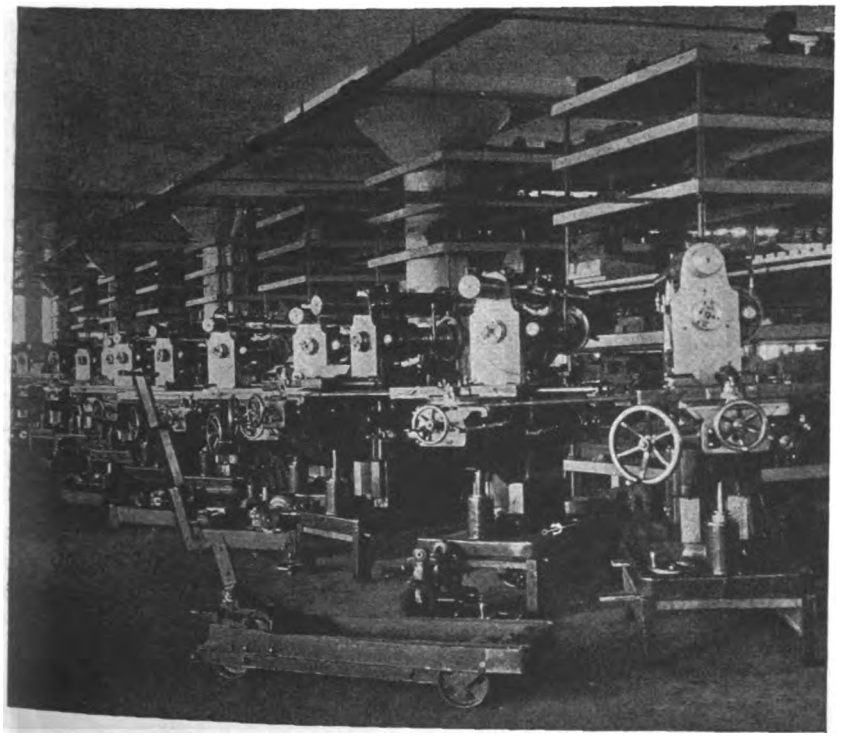
As an example of how the work is routed, the route card shown on page 42 is for a detail of 10 Head-Stocks, Style "F," Symbol #9MC-6AI Lot 7385.

Sec. 1, is the time planning card detached from Sec. 2, and placed in a transparent envelope and attached to Sec. 3 with spring clip. Sec. 2, is removed by clerk in Casting Storage Dept. amount and weight deducted from stock file, then Sec. 2 is sent to Cost Dept. Sec. 3 with Sec. 1 is sent out with job loaded on platforms, the amount on platforms determined by weight as well as safety, and is guarded by sectional frames.

Sec. 1, you will note that these Ten (10) castings are to leave, Dept. 7, (which is the casting storage as well as cleaning departments) May 27th to be in Dept. 10, (the planer dept.) May 27th. These are to leave Dept. 10, June 3rd, for Dept. 8, (which is the drill press dept.) for drilling counterbore and tap bottom, leave Dept. 8, June 7th, for Dept. 35 to have bottom surface scraped. Leave Dept. 35, June 9th for Dept. 9, for milling sides end and top, Leave Dept. 9, June 15th for Dept. 8 for complete drilling.

June 15th an order was issued to Tool Supply Dept. #21 to have Universal angle plate #3886 with Drilling Jig #7-9MC-6A-1, with tools, in Dept. 8, and accordingly Foreman of Dept. #8 phones to Foreman of Transportation

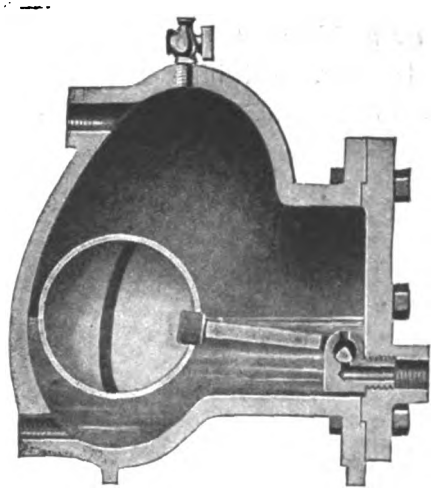
(*Continued on Page 48*)



Twelve No. 3 LeBlond Milling Machines, ready for shipment, weight of each of these machines as they appear on photo, equal, 5000 lbs. Note: Special handle on large Stuebing truck, so truck can be placed full length under platform, and double lift executed without interference with finished parts on front of knee or handle of truck.

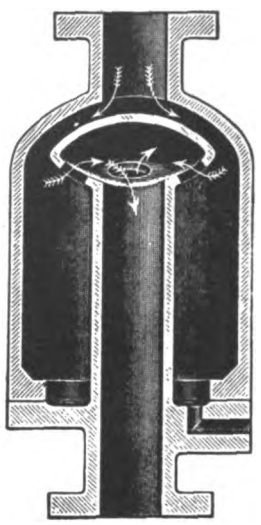
Three Coal—Savers

The Corliss Valve Steam Trap, embodying the only valve which mechanically compensates for wear. Removes all condensation from steam lines without any possibility of steam leakage. Sold with a two-year guarantee of perfect service.

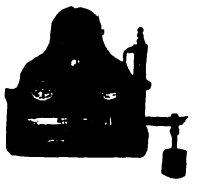


THERE are many so-called "coal-savers" which are theoretically good. But the practical test lies in *saving more coal-dollars than they cost*. This is the test that determines their worth; and it is the test which---in many years of service---puts the stamp of final approval on the three coal-savers shown here.

No plant, today, can afford expensive experiments. But no plant can afford to overlook actual, proved methods of reducing the cost of steam. The coupon, below, will bring complete information.



The Peeco Steam Separator, which removes entrained water and condensation, supplying absolutely dry steam to the engine with no retarding to the velocity. Results in a lower steam consumption, freedom from packing troubles.



Automatic Draft and Water Regulator, controls automatically---the fuel, air and water fed to your boilers for the generation of steam. Effects a coal-saving of 10% or better.

Plant Engineering & Equipment Co., Inc.

192 Broadway
New York City, U. S. A.

PLANT ENGINEERING & EQUIPMENT CO. BRANCHES

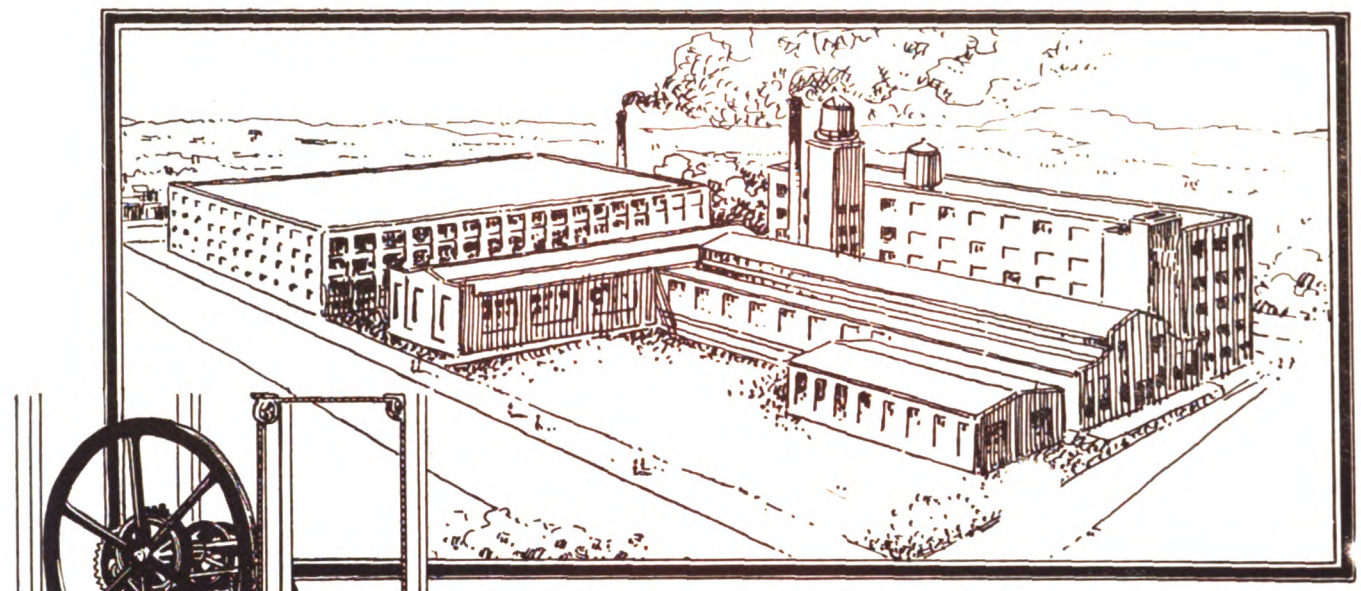
MASS.,	Boston, 10 High Street
R. I.,	Providence, 511 Westminster Street
CONN.,	Bridgeport, 945 Main Street
N. Y.,	Syracuse, 445 So. Warren St.
N. Y.,	Watertown, 224 Factory Street
N. J.,	Newark, 845 Broad Street
N. J.,	Atlantic City, 11 So. No. Carolina Ave.
PENN.,	Philadelphia, 527 Commercial Trust Bldg.
PENN.,	Pittsburgh, 217 Water Street
N. C.	Asheville, P. O. Box 667
GA.,	Newnan, P. O. Box 246
LA.,	New Orleans, Whitney Central Bldg.
KY.,	Louisville, 111 North Third Street
O.,	Cincinnati, 3621 Columbia Ave.
O.,	Youngstown, 507 Stambaugh Bldg.
ILL.,	Chicago, 30 No. Michigan Boulvd.
MO.,	St. Louis, 1967 Ry. Exchange Bldg.
MO.,	Kansas City, 312 Elmhurst Bldg.
NEB.,	Omaha, 504 First Nat. Bank Bldg.
OKLA.,	Tulsa, 425 Iowa Bldg.
COLO.,	Denver, 932 Equitable Bldg.
CALIF.,	San Francisco, 115 Mission St.
WASH.,	Spokane, South 2818 Scott St.
VIRGIN I.,	St. Thomas, Main Street
CAN.,	Montreal, H. P. Ross, 180 St. James St
CUBA,	Havana, Victor C. Mendoza,
HOLLAND,	The Hague, Rubenk & Co.
FRANCE,	Bordeaux, 53 Rue Borie

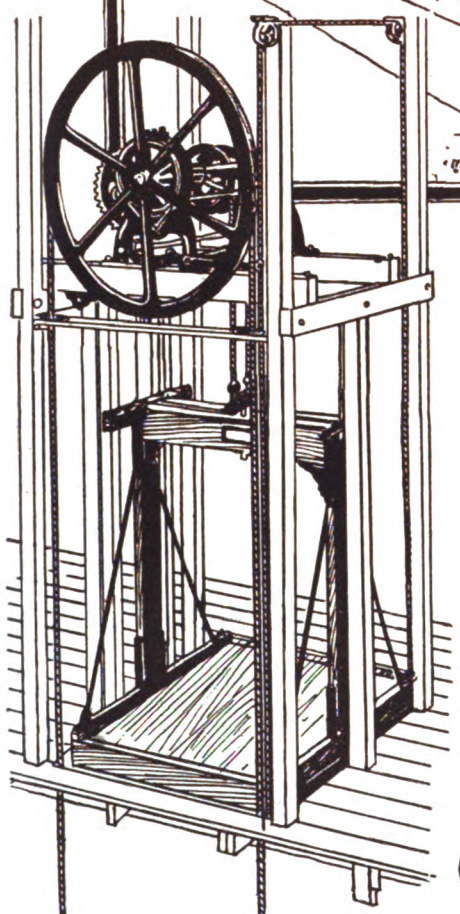
Save Money by Saving Steam By saving Coal.

Please address to Nearest Branch Office
Gentlemen: Please send me full information on:
( ) Steam Traps ( ) Pumps of all kinds
( ) Strainers ( ) Separators
( ) Condensation Meters
( ) Please send your complete catalog for our files.
Name of Company .....
Name of Individual .....
Address .....

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who dispatches Electric Lift Truck to convey tools to above dept. Note: Small blue print attached by the Routing Dept. The routing clerk discovered, that by making a tracing, and from tracing, stock blue prints hours of clerical work would be saved, instead of filling out space allotted for routing memoranda. Amounts for each detail are carried in his filing case and can be attached quickly, without delay, to Routing Card. June 20th the trucker removes from the loading station Department 8, these ten headstocks, to Department 11 for Painting, the 25th of June, the trucker removes lot to Finished Storage. This completes the operations up to assembly, this lot of headstocks.





Look at the List of Users

Here are leaders in practically every field of American industry who know from experience the value and quality of Sedgwick Dumb Waiters and Hand-Power Elevators.

For moving materials, tools and products, finished or in process, from floor to floor—for the transmission of books and papers between office floors—for innumerable purposes where the use of power elevators would prove uneconomical, and to supplement or supplant power elevators—Sedgwick Dumb Waiters, Hand-Power Elevators and Gravity Lifts effect substantial savings and increase production efficiency.

SEDGWICK machines require no skilled operators, are moderate in first cost, involve no expense for power, and practically no maintenance cost.

Our thirty years of experience in adapting this class of equipment to industrial requirements is at your service. Send for bulletins and descriptive literature.

Sedgwick Machine Works

Dumb Waiters and Hand-Power Elevators

140 West 15th Street, New York, N. Y.

120-50

SEDGWICK

DUMB WAITERS & HAND POWER ELEVATORS

American Bank Note Co.
American Blower Co.
American Car & Foundry Co.
American Cotton Oil Co.
American Druggists Syndicate
American Lead Pencil Co.
American Railway Supply Co.
American Sugar Refining Co.
American Tobacco Co.
Ansonia Clock Co.
Apperson Bros. Automobile Company
Atlas Powder Co.
Berkey & Gay Furniture Co.
Bradley & Hubbard Mfg. Co.
The Bush Terminal
Cadillac Motor Car Co.
The Childs Restaurant Co.
Eastman Kodak Co.
Edison Mfg. Co.
Edison Phonograph Works
Fleischman Co.
General Motors Truck Co.
Goodrich Tire Co.
Goodrich Tire & Rubber Co.
Kirkman Soap Co.
Louis K. Liggett Co.
Lipton T. J. Tea Co.
Kresge S. S. Co.
National Biscuit Co.
National Cash Register Co.
N Y. C. & H. R. R. R. Co.
N. Y. Edison Co.
N. Y. & N. J. Telephone Co.
N. Y. Telephone Co.
Packard Motor Car Co.
Pennsylvania R. R. Co.
Pratt & Lambert Varnish Co.
Rushmore Dynamo Works
Seabury & Johnson
Singer Mfg. Co.
Smith Premier Typewriter Company
Standard Oil Co.
Toledo Shipbuilding Co.
Tonawanda Power Co.
United States Ordnance Department
Vitagraph Co.
War Dept. U. S. Govt.
Weber Piano Co.
Western Clock Mfg. Co.
Winchester Repeating Arms Co.
Woolworth F. W. Co.

The Three Principal Factors

(*Continued from Page 23*)

production and with a great shortage of man power, was in receptive mood for any kind of an experiment. As a result many experiments in loyalty promotion were tried. During the present readjustment period these have been curtailed and in many instances have been discontinued and looked upon as useless investments.

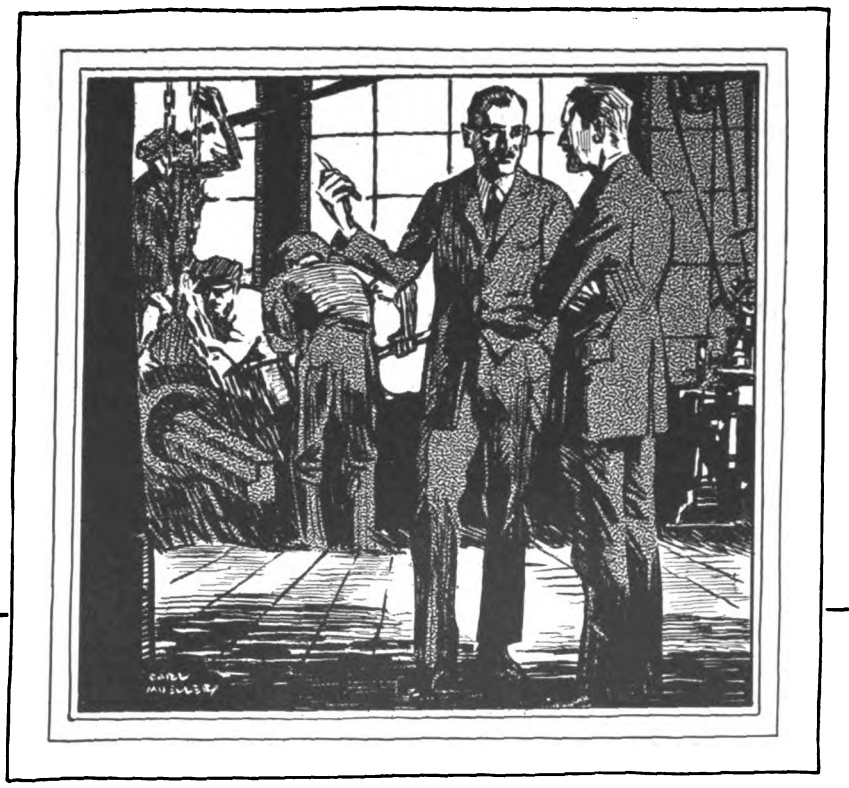
Through a long and close contact with both men and management in many lines of industry, I have come to the conclusion that the principal factors in promoting loyalty are: First, proper construction and location of the plant; second, good housing conditions for employees; third, leadership.

Pleasurable working surroundings constitute an important psychological factor which has a decided effect upon efficiency through physical well being. Chilly surroundings, for example, develop fear while warmth of body reduces fear or dread and helps to overcome discontent. Fireproof buildings with plenty of light and ventilation, proper sanitation and cleanliness, and with suitable safety devices both for fire and accidents, make the plant more than a mere place to work.

Last of all and most important of all is leadership. To inspire loyalty the leader must be a gentleman not in mere superficial attainments, but in real qualities of heart and mind. He should regard men as of more value than things and should be regarded by men as an honorable friend and just judge. He should be able to see and to explain that the principle aims of capital and labor are joint and common ones. He should see that efficiency is properly rewarded in distribution of income; that men are not discharged for unjust causes, that the incapable inefficients are eliminated and that promotion is justified through a record of achievement.

Leadership that comes from the heart will do more to prevent strife and to promote loyalty than all of the welfare plans and ideas ever tried out

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"How Can We Insure the Fullest Co-operation With Our Foremen?"

A busy president of a large company sat looking over the control sheets that his superintendent had just handed him, indicating the volume and rate of production in the plant, as well as the prevailing costs.

"Charlie," he said, "There seems to be something wrong out in the plant. I feel that we are in a dangerous position. The goods are coming through fast and you are maintaining quality, but where is the lowered cost of labor we all agreed was necessary?"

This is a vital question in hundreds of industrial plants today. Reducing the wage rate or the number of employees isn't always the answer; without perfect teamwork and a common understanding of the problems of management, it is useless to look for real economies.

How the Foreman Can Reduce Costs

You—your officers and directors in the front office—can decide on plans and policies, but to see that they are carried out in a spirit of entire good will and mutual understanding is a task that rests finally with your foreman. If they are not real executives, trained in the fundamentals of management, but are only workmen of a superior type, you are in a dangerous position.

In the better plants today, it is realized that the foreman must be of a higher type—a real executive; he is the "key man" in the shop, the channel through which your plans and policies must be translated to the working force. He must have special help and training to meet the needs of the present situation.

A New Way of Training Foremen

Many companies realizing the need of developing the executive ability of their foremen, have sought to fill the gap by conducting regular foremen's meetings, at which the routine problems of the shop are discussed.

A far better and more practical plan is to give their foremen and other key men about the plant an intensive group training in modern production methods which will develop their executive ability.

Because of their success in adapting this training plan to the peculiar needs of foremen, the Business Training Corporation, of New York, has been engaged to carry on this work in more than 500 leading plants, representing almost every type of industry.

The popularity of the course with the thirty thousand employees enrolled is due to the clear, simple, and eye opening nature of the study methods. The foremen like it because it holds their interest throughout and leaves them with a new insight into their jobs. It has made good with the management because it develops a greater spirit of team work in the plant, energizes the men to more productive effort, and has an appreciable effect in reducing labor turnover and costs.

Your big problem today is economical operation. You should therefore read our brief report "Making Better Foremen," which we gladly send to executives without obligation. It gives all details of our unique plan, and the experience of some of the well-known concerns who have used it.

Business Training Corporation

"Greater Team Work Through Group Training."

185 Madison Avenue *New York City*

Business Training Corporation 185 Madison Avenue NEW YORK, N. Y.

Send me without obligation the Special Report, "A Plan for Making Better Foremen."

*Name*_____

*Company*_____

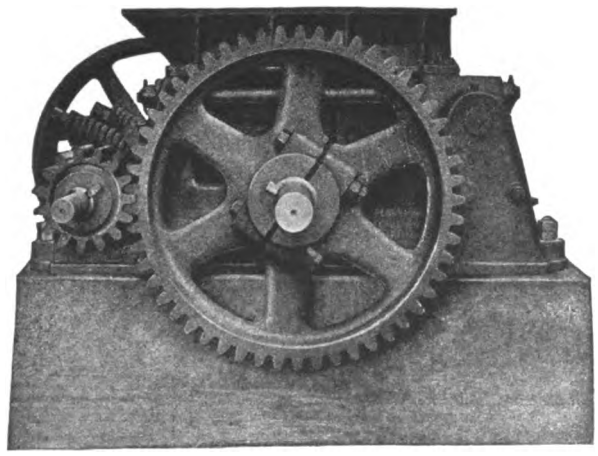
*Address*_____

*Position*_____

*Number of Employees*_____

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"PENNSYLVANIA" SINGLE ROLL COAL CRUSHER



Preparing Coal For Your Stokers

ORDINARY bituminous coal at destination can be crushed readily enough without imposing serious work on the Crusher. Numerous installations have been made on this theory, with the Crusher as an obscure part of the general coal handling machinery contract. Serious trouble has often been encountered in such cases, due to the fact that many different kinds of coal must be handled in times of shortage, and large tramp iron is often mixed with the coal.

For these reasons, increasing attention has been given to the design of crushing machinery, both by manufacturers and engineers, to insure satisfactory service when crushing heavy block coal and encountering miscellaneous trap iron.

This service calls for intelligent design, massive construction and double tramp iron protection by powerful relief springs and shear pin safety device. Such construction in the New Series of "Pennsylvania" Single Roll Coal Crushers insures maximum reduction of heavy R. O. M. Coal in one operation, uniform stoker fuel and uninterrupted service.

Capacities range from 20 to 300 tons per hour.

Prompt shipments insure proper preparation of this winter's coal supply.

Helpful engineering service and Bulletins on request

PUT YOUR COAL PREPARATION PROBLEMS UP TO US

PENNSYLVANIA CRUSHER COMPANY

Stephen Girard Building

Philadelphia

New York **Pittsburgh**

The Dean of Carbon Black

(Continued from Page 6)

sive, ranging from the digging of post holes and the performance of every sort of both crude and skilled labor connected with the business, to the active management and operation of various of his plants. When he started to manufacture carbon black in 1887, the total annual output in this country was not more than a million pounds. Today it is an excess of fifty million pounds per year.

Carbon black is not the same as lamp black. Lamp black is the soot deposited by a smudge process from oil, resin or some other solid or liquid raw material. Carbon black, on the other hand is deposited by actual contact of a flame upon a metallic surface. Usually a radial pipe, perforated and acting as a natural gas burner is rotated under a gigantic metal plate 24 feet in diameter, the plate being kept cool by the circulation of water. As the rotating arm with its row of gas flames swings slowly under the plate and covers its surface with deposited carbon black, it is followed by a scraper arm that scrapes the deposit into a radial box from which it is emptied at regular intervals. When first scraped from the plates, carbon black is so light that thirty pounds of it will fill a sugar barrel. Ninety-five per cent of the bulk of the material as it comes from the plates is air and the problem of packing is to separate this black from the air by screw or plunger presses. It is possible in this way to get eighty pounds into a barrel, which means that the black is compressed to about one-third of its original bulk.

By far the greater part of the demand for carbon black comes from the manufacturers of rubber goods who use it as an ingredient for increasing tensile strength and helping resist decay. Rubber tires, rubber heels and soles, and phonograph records are among the every-day products to which carbon black lends strength and endurance.

Mr. Cabot, coming as closely as he does in contact with the rubber trade, is in an exceptional position to predict the future developments in the rubber industry. He believes that the present low prices of rubber will continue and that, because of its cheapness and the great quantities in which it is available, many new uses will be found for rubber.

"In Sumatra," said Mr. Cabot, "the artificial selection of the most productive rubber trees has greatly increased the output per tree and per acre, in some instances as much as six times. Due to this and other causes, it seems reasonable that the present low price of rubber will become a ruling price with the result that the very extraordinary development of this industry will proceed year after year even more rapidly. We shall see rubber replacing lumber and other floor covering. Quite likely it will be used as pavement on private avenues by multi-millionaires and in other places where the expense will be justified by the comfort, quietness and convenience."

Mr. Cabot owns factories and works at Cabot, Pa., Creston and Bristol, W. Va., Grantsville, W. Va., Glasgow, W. Va., and Howard, La., among which are the largest works of their kind in the world. He also owns the controlling interest in the Monarch Carbon Company, of Charleston, W. Va. He is a member of the Society of Chemical Industry, American Chemical Society, and, as noted under his portrait, is a commander of naval aviation.

Developing Our National Resources

(Continued from Page 14)

ment that changes the competency of the appointee. An incompetent private citizen is not transformed into a competent public servant either by election or appointment. Then, too, the incentive of private ownership is wholly lacking. Government ownership cannot make good in private business because it cannot develop the ablest type of executive or attract them from private business. Government ownership

(Continued on Page 52)

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What is your waste?

Herbert Hoover's Committee, appointed while he was president of the Federated American Engineering Societies, on which Mr. C. E. Knoeppel had the honor of serving, issued a report of interest entitled "Waste in Industry."

It classifies all waste in four divisions as due to, low production, interrupted production or idleness, restricted production; and lost production.

It considers that management is responsible for from 50 to 80 per cent of these wastes.

Upon request we will without obligation outline a plan to have a firm member make an analysis of your business much the same as the report covers all industry.

This will point out specifically your particular kind of waste and a way toward its elimination based on proven results.

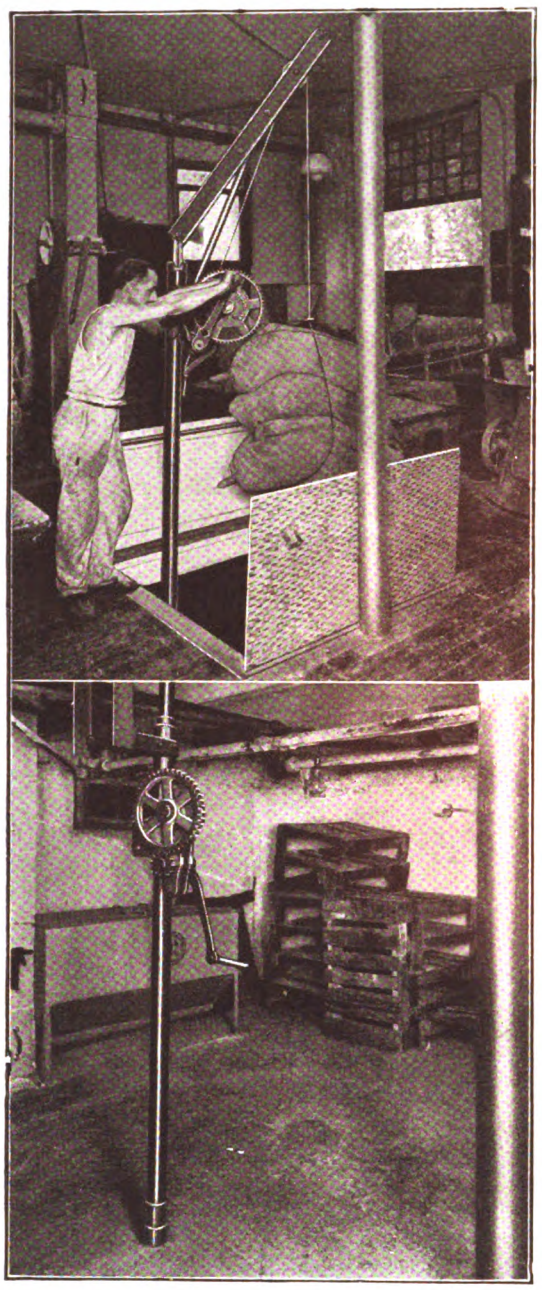
Our Blue Book describes waste prevention. Write for it today.

Knoeppel
Organized Service
"We can describe our plan briefly"

C. E. KNOEPPEL & CO., Inc.
Industrial Engineers

52 VANDERBILT AVENUE NEW YORK

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G &. G Model B Telescopic Hoist as used in e large bakery for quick handling of bags of flour between floors.

For Industrial Loads up to 1000 lbs.

G & G HOISTS provide quick and economical handling of loads between floors inside or outside of the building, and for the removal of ashes from cellar to grade level or directly into ash wagon.



Write for descriptive matter, prices, and partial list of industrial users.

Model A Non-Telescopic Hoist as used by Packard Motor Car Co., for handling coke and core sand.

Model D (Electric) Hoist as used by Mergenthaler Linotype Co., Brooklyn. Empties ashes directly into truck.



GILLIS & GEOGHEGAN
556 West Broadway, New York
Makers of
the G&G
REG. U.S. PAT. OFF.
Telescopic Hoist
with Automatic Gear Shifting Brake
Device and Silencer

(*Continued from Page 50*)

does not make men or make money, but it does make job holders, grafters, autocrats and deficits. Government ownership makes for socialism, which is the first lesson in Bolshevism, and this is the last lesson in government.

No matter by what processes or through what channels the government or states acquire funds, they are in every case a direct or indirect tax and the burden in every case falls upon the tax payer. The piling up of public debts and taxes makes for higher costs of living and can only be stopped by efficiency and economy, which are very seldom available through public administration. This country is now the haven for thousands of people fleeing from taxation and government ownership.

On the side of the great Public Utilities it must be admitted they are not accidents. They are the materialization of tremendous effort to provide for the comfort and convenience of the people, with the great incentive that the effort will be profitable.

No other country has had such marvellous industrial development and expansion during the last fifty years as the United States and nothing has contributed more to this than the discovery and application of electricity as we know it today. No other country has such advanced standards of living as we and the mass of our people have comforts and conveniences which in other countries only the wealthy enjoy. How much longer we shall enjoy these conditions and to what extent we shall expand our industrial development is a practical business question.

This industrial development and social betterment have come through the development of our natural resources and nothing has contributed more to this result than has the massing of electric power production and its wide distribution by transmission lines. There are so comparatively few people in the Public Utility business that it is not generally understood, although I think it is now recognized and admitted that the consolidation of Public Utilities makes possible better service at less cost. True, they could not thrive if there were no industries and centers of population; but, on the other hand, centers of population and industry cannot thrive without the services provided by the Public Utilities.

Public Utilities are no longer local enterprises. Suburban communities too small to maintain their own utilities get service from their city neighbors and thus city conveniences are extended into the suburbs and in this way production on a large scale results in economy and efficiency. Where the companies' customers substantially all demanded one kind of service, this demand was limited to a small part of the day, leaving extensive plants, if not entirely idle, then largely unemployed during most of the day. Thus, other fields for their use were sought and from this grew the central plant idea that linked up many small communities by transmission lines and made low rates possible for small as well as large industrial enterprises. Uneconomical and unprofitable local plants were discontinued and local communities got the advantage of production on a larger scale from central plants generally advantageously located with respect to railroad facilities, water supply, coal, labor, etc., so that production costs per unit are the lowest possible and many communities much too small to have plants of their own are linked up with the larger cities.

In Illinois 196 communities are served by a single electric distribution system and communities with as few as fifty people get the benefit of the same service as residents of the largest cities. One company in Northern Illinois serves a territory as large as the two states of Rhode Island and Connecticut.

Another example of unified operation is the telephone system, beginning, one might say, at Boston and ending in San Francisco, touching every city, village and hamlet between, so that there is no telephone service enjoyed by the largest business house in the city of New York that is not instantly available to exactly the same extent to the most remotely located farmer in the states transversed. Just as the Public Utilities once crossed city limits and county lines, so must

(*Continued on Page 55*)

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Decreasing Costs When Production is Limited

The problem of decreasing costs in face of limited production is simplified and often times solved by getting production facts.

Our business is gathering, organizing, and interpreting facts—devising systems and methods —counseling on operating and financial procedure.

We invite the opportunity to explain our services

H. M. WEBSTER & COMPANY

New York, N. Y.
25 West 43rd Street

Albany, N. Y.
82 State Street

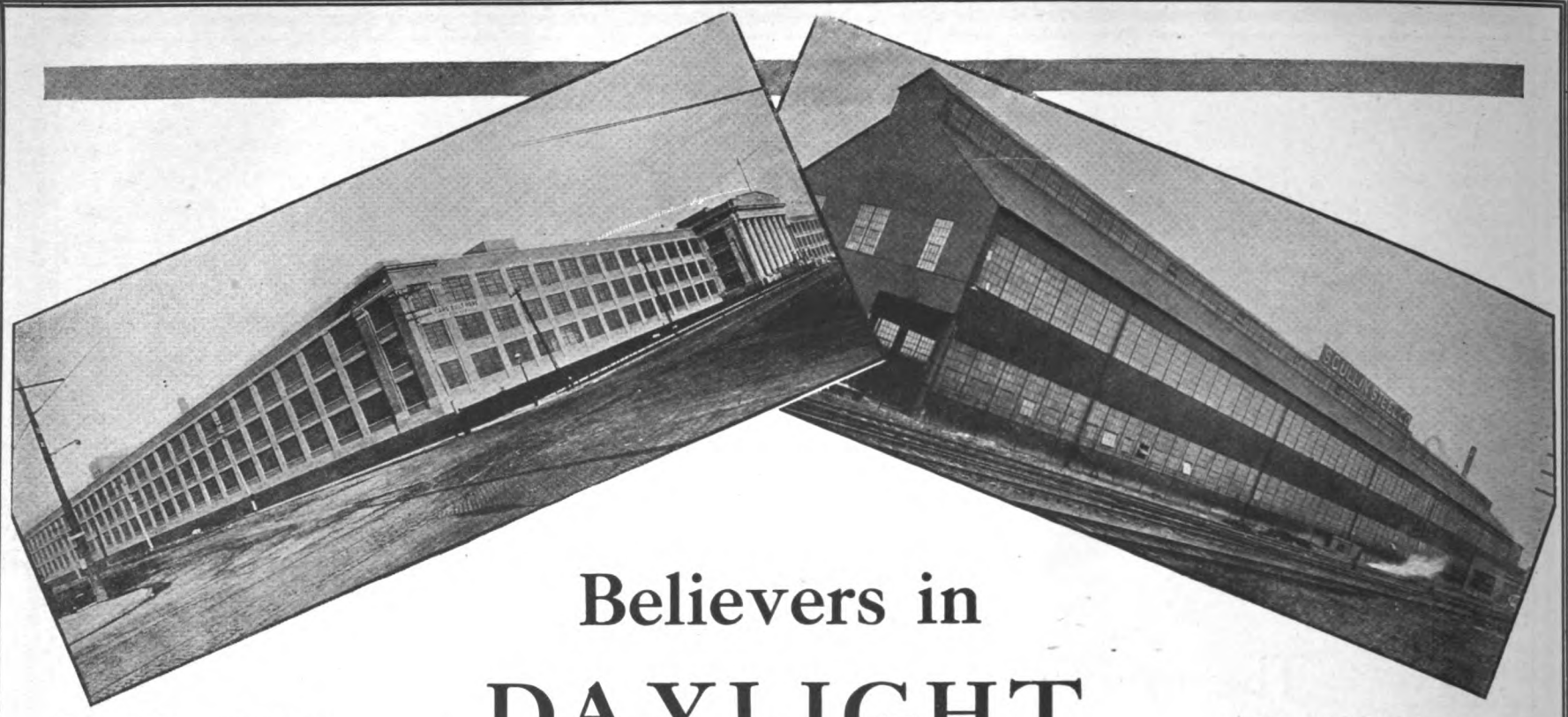
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General Motors, Buick Factory, St. Louis, Mo. ⅛" Mississippi Ribbed Glass, Mississippi Polished Wire Glass.

Scullen Steel Co., St. Louis, Mo. ⅛" Mississippi Ribbed Glass.

Believers in DAYLIGHT ILLUMINATION

These are a few of the many structures that make efficient use of daylight, while at the same time minimizing fire risks. There are many types and designs of Mississippi Products.....among them, the one that suits YOUR needs.

Ask for catalog and sample of glass suitable for use as a Paperweight

MISSISSIPPI GLASS CO.
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219 FIFTH AVENUE
NEW YORK

ST. LOUIS CHICAGO

Dunlop Tire & Rubber Corporation of America at Buffalo, N. Y. ⅛" Factrolite, ¼" Factrolite Wire Glass.



Dunlop Tire & Rubber Corporation of America, Buffalo, N. Y. ⅛" Factrolite Glass, ¼" Factrolite Wire Glass.

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(Continued from Page 52)

they, to bring their full measure of usefulness to commerce and industry, cross state boundaries and become interstate in their operations.

An interesting example of what mass production and distribution mean is to be found by comparing the electric output in the city of Chicago, with 2,700,000 inhabitants, and the county of London, with 7,750,000 inhabitants. Here, owing to its laws, there are some sixty light and power organizations, while within the city of Chicago there is but one; yet the output in kilowatt hours in Chicago is twice that of the united production in the county of London and the demand there is only about two-thirds that of Chicago, where the production per capita per annum is about 500 kilowatt hours as compared to about 75 kilowatts in London. The reason for this great difference is the selling price which, in Chicago, is about half the cost of manufacture in London. The great advantages enjoyed by the people of Chicago are the result of massed production and the sincere effort of hard working and efficient men in private service who would not for a moment enter either government or municipal service.

The United State Geological Survey, by direction of Congress, has just completed a survey of the power resources of the Atlantic seaboard between Boston and Washington with a view to determining what economies would result from the inter-connection of existing generating facilities of the power companies in that region and the providing of additional capacity through the construction of hydro-electric works and steam plants located at coal mines. The result of this investigation shows that the requirements of energy to be supplied by electric utilities for municipal, private, industrial and railway use in the affected area in 1930 will be 31,000,000,000 kilowatt hours and that this energy can be supplied by a coördinated power system at an annual cost of $230,000,000 less than by the uncoördinated systems now in use. This figure represents a net saving after fixed charges on total investment requirements have been deducted.

This study further showed that the 96,000 manufacturing establishments now operating within the zone can save $190,000,000 annually above interest on the investment of $185,000,000 required to provide the equipment necessary to utilize the power. The combined capital investment for utilities and industries as of 1930 will amount to $1,294,564,000 and this total investment will yield $492,000,000 in excess of all fixed charges, or about 33% on the investment.

If these figures prove anything, it is that such operations as the ones cited are necessary to our industrial development, the important question being whether they shall be done by the Government or States or through the development of our Public Utilities. To the right thinking person there can be but one answer and Theodore Roosevelt made it when he said: "I do not believe in government ownership of anything that can with propriety be left in private hands."



Reduce Handwork and Manufacturing Costs With No. 5 "Little David" Drills

These lightweight pneumatic drills are used for reaming, drilling, running in cap screws, tightening nuts and bolts and for dozens of other operations.

They are speedy workers and greatly reduce hand labor charges.

"Little David" Drills are rugged powerful machines that will stand up under continued hard use. They have from 25% to 30% less parts and are that much easier to keep in repair. A complete range of styles and sizes is available for the many classes of automobile work.

Catalog 8000 describes them all.

Ingersoll-Rand Company

General Offices; 11 Broadway, New York

PRICE · IR · OIL ENGINES

227-PT

Ingersoll-Rand

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The General Manager Sent for Jim Casey

"JIM," said the G. M., "we're spending entirely too much money in handling our material. It's eating up all our profits. I want you to see if you can't cut costs at this end of our production, all over the plant. You simply MUST. Either that, or——"

Jim Casey knew what that "or" meant. It gave him the shivers to hear it—as it had many a good man before him.

So, not much supper did Jim eat that night. Nor did he tarry long to play with the kiddies—or even to read his paper.

But he bolted for his den—locked himself in—and, as on many a night before, puffed furiously at his pipe, scratched his head, knitted his brows, and spoiled sheet after sheet of perfectly good paper, in trying to figure out ways and means for chipping those handling costs.

As on many a night before, midnight found him no nearer the goal than he was when he started.

"Aw, what's the use?", he yawned to himself as the wee sma' hours approached. "I give it up. My lower costs are like the core of the boy's apple—'there ain't going to be any.' My costs are down to bedrock now. I don't see how I can reduce them. But the G. M. doesn't seem to see it that way. I wonder if he meant that "or"? Well, it won't help to cry over the milk before it is spilt. I guess I'll do a spell of reading before I turn in. Where's that new magazine that came the other day?"



So he picked up the November INDUSTRY ILLUSTRATED.

Long toward page 23, he saw something that made him give vent to a whoop that woke up the whole family.

"By George," he exclaimed. "Who would have thought it? These nineteen pictures plastering this article on "The Passing of the Roustabout" give me a troop of brand new ideas. Ideas that will save the company the hire of oodles of dagoes, and, what's quite to the point, just now, will make my job bigger and securer than ever."

And they did.

Not only for Jim Casey, but for hundreds of others.

Industry Is Full of Jim Caseys—
Big and Little—

Presidents—managers—engineers—foremen—upon whom plant owners are depending for the new ideas that will stabilize profits and cut costs during this year of 1922—both made imperative by the new conditions confronting us at the dawn of the new year.

INDUSTRY ILLUSTRATED is full of such ideas

The Engineering Magazine Company
120 West 32nd Street, New York

Help me out, as you did Jim Casey and his general manager, by sending me INDUSTRY ILLUSTRATED every month for a year. I shall remit the subscription price on receipt of your bill, sometime within the next thirty days.

NAME .....

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City ..... State.....

Company ..... Position.....

Annual Subscription Price, $1. In Canada, $1.25; Foreign, $1.50. (JC)

gathered out of the experience and the photograph albums of hundreds of other Jim Caseys. Presented pictorially, so you can absorb, in a few minutes, more information and inspiration than you could get in as many hours of hard study and intensive reading elsewhere.

Who Knows

but that the use of the coupon to the left—NOW—will put *you* in the way of keeping a place on your company's map from which the storms of a dozen "periods of depression"—hand-running—could not shake you?

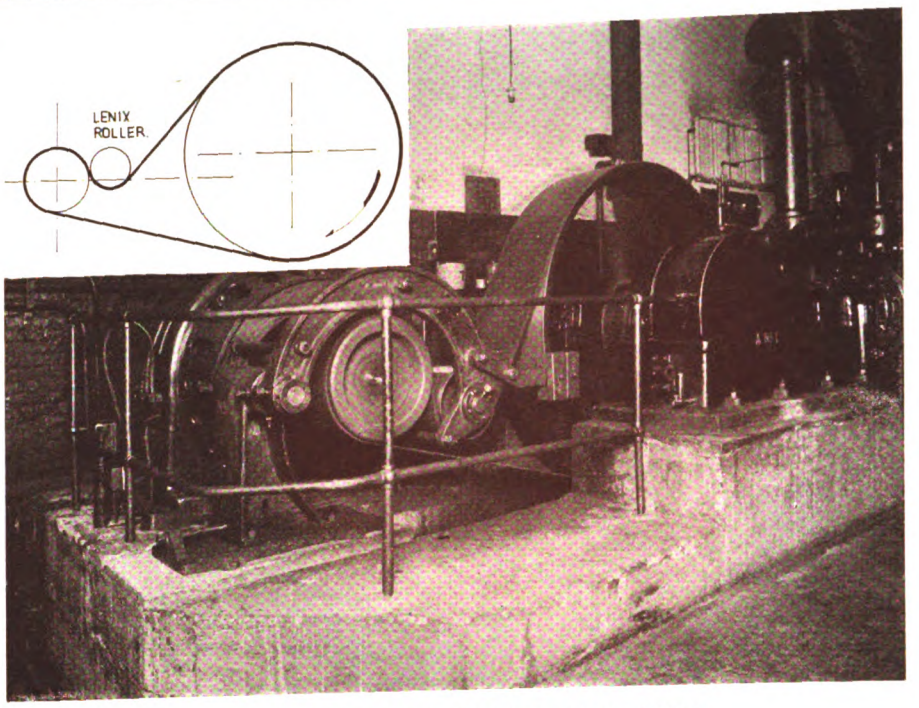
Think of it—twelve big, bright issues like this for a DOLLAR

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Saving Space

Driving Pulley
19" Dia. 18" Face,
938 R. P. M.

Double Leather Belt
15" Wide; 5-16" Thick
Speed 4680 Feet
per Minute



150 H. P. MOTOR DRIVEN AIR COMPRESSOR

Driven Pulley
66" Dia., 15" Face,
270 R. P. M.

Pully Centers
6'0"

The Lenix Drive

made possible this compact and efficient installation.

The floor space occupied by long center, open belt drives is unproductive. THE LENIX DRIVE will make available for new machinery this space through the use of short pulley centers which in turn will SAVE in the INITIAL COSTS OF BELTS.

Slippage is eliminated by the greatly increased arc of contact—SAVING POWER. Belt worries are reduced to a minimum and the greatest efficiency obtained whether your drive is horizontal, vertical or quarter-turn or whether the tight side of the belt is on top or bottom.

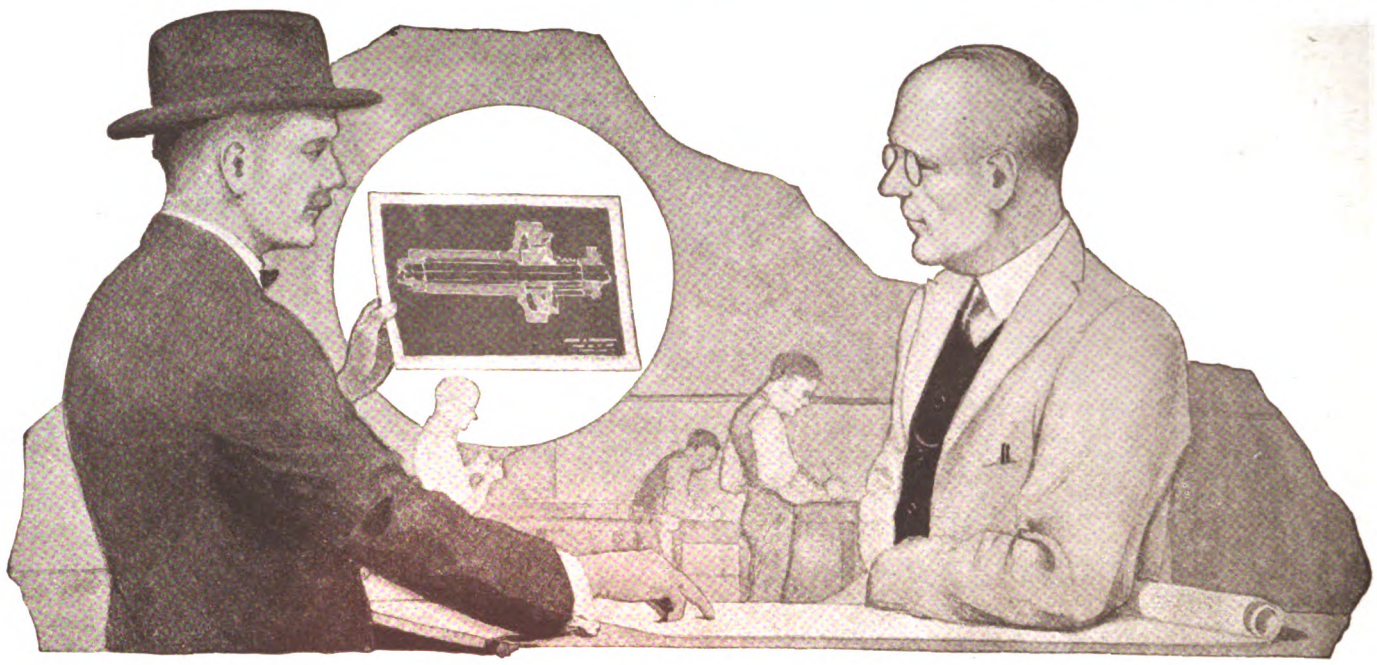
The Booklet "SAVING SLIPPAGE AND SPACE" is convincing.
Ask us for it.

F. L. Smidth & Co.

ENGINEERS

50 Church Street **New York, N. Y.**

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These Photostat Prints Save as Much as $800 a Week

A well-known mid-western tool company writes:

"AS a matter of fact, thirty draftsmen would be required to handle the work that ten draftsmen and one PHOTOSTAT now accomplish, which is a direct saving in salaries alone of approximately $800 per week."

Tracing isn't necessary, because you can copy with the PHOTOSTAT in a few minutes either a drawing, a pencil sketch or a blueprint which it would take hours, and in some cases even days, to trace. The PHOTOSTAT is not limited to copying drawings and blueprints. It is widely used for office copying work, such as letters, telegrams, reports, shipping lists, contracts, ledger pages, insurance records, graphs, and legal documents. In all this work the PHOTOSTAT takes minutes where other methods require hours, and with the PHOTOSTAT there is absolutely no possibility of error.

The PHOTOSTAT makes no mistakes
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It makes photographic facsimiles

Any steady office boy or girl can learn to run a PHOTOSTAT in a few hours.

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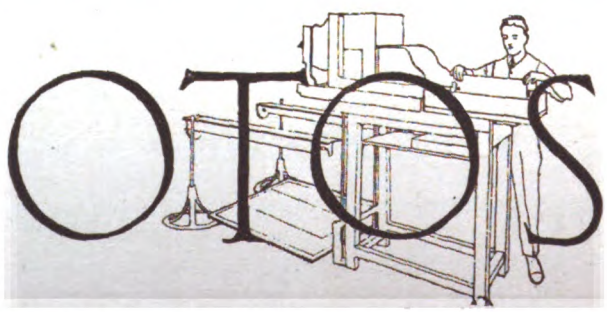
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601 McLachlen Bldg., Washington

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Graham Brothers, Stockholm

PHOTOSTAT



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Light as a Production Factor

(Continued from Page 28)

eral states where the actual reason why employees have remained with their employers, or have returned to them, was the installing of better light.

One of the first considerations in lighting is to use as much daylight as possible in the lighting of the plant during the daylight hours. It is a fact readily agreed to that willingness to work and ability to do so are greatly influenced by the proper amount of light upon the job. Workers seem to lose ambition in a darkened room. Yet place the same men in a well-lighted room and see the difference in them. A darkened room makes them sleepy much of the time.

The well-lighted workroom is nearly always kept neat and clean by the workers; the dimly-lighted room is almost sure to be untidy and littered up, because the rubbish is not so easily seen. The workers take more pride in the well-lighted room than they do in the dimly-lighted work place.

Inadequate lighting has cost more in errors and accidents than any other factor. It has been estimated that there are more than twenty-five millions of dollars wasted annually because of improper lighting of plants. This is because many parts in a dimly-lighted room appear to be correct and especially in production on automatic machines where little attention is given to the adjustment until a part appears that is incorrect. At that time many parts have beyond doubt been finished incorrect because of insufficient light to discover the error.

The sidewall of windows offers the greatest opportunity to make the plant light. In addition to this, such a window permits thorough ventilation. The fresh air which can be brought to the workers through the opened windows is a sufficient reason to recommend such construction. However, the light which can be had in this manner is of even greater importance.

Architecturally these windows are attractive; they are simple to operate and inexpensive to maintain. Many of the greatest business leaders have learned this and have made plans to have them installed in their old buildings as well as in the buildings they proposed to erect.

The Monitor sash is very highly recommended where an even light is required upon the work. This sort of window permits light to fall upon the worker more evenly, especially if the glass on the south, east, and west sides are frosted. The glass on the north sides should in every case be clear. One of the best Monitor installations that the writer has seen is in the new Dodge Brothers Plant in Detroit, Mich. This Monitor is fourteen feet high, with three sections of window horizontally pivoted, and is an excellent type for use in such conditions.

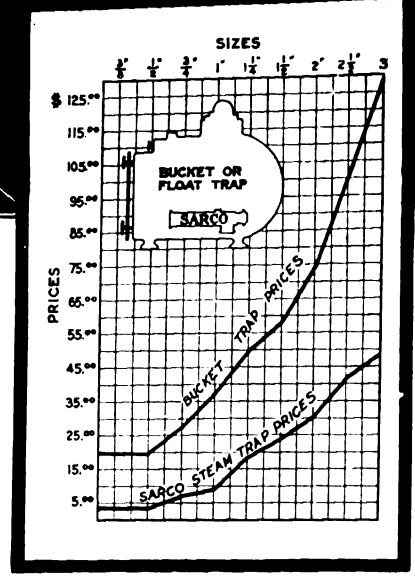
Partitions, the upper half of which are glass, have proved most profitable. The writer has been most favorably impressed by the installation of the Pennsylvania Rubber Company. In cases of this sort, light is permitted to pass through, greatly brightening the rooms of the inner section of the building.

The accident cost of modern industry is one of the factors that the manufacturer has to consider. Accidents cause loss of time to the worker (and later financial difficulties); they cause loss to production and make it difficult to meet production schedules. Accidents, moreover, usually happen just when the plant is running at its highest speed, when the worker can least afford to be slowed down. Good lighting helps to prevent accidents. Workmen are prevented from running into danger spots, falling over obstacles, and getting caught in moving parts of machines.

Glare retards production as does lack of light. For this reason shrewd manufacturers are fast coming to realize the importance of shades where clear glass is used. This is most common in plants working upon very fine parts. The writer has been most favorably impressed by the results of the Remington Typewriter Company in this respect. There are various styles of shades in use, but the most popular is that shown on page 26. In this case the light enters between the slats with an even diffusion, permitting the workers to see without the glare so common where the sun shines direct into the workroom.

(Continued on Page 60)

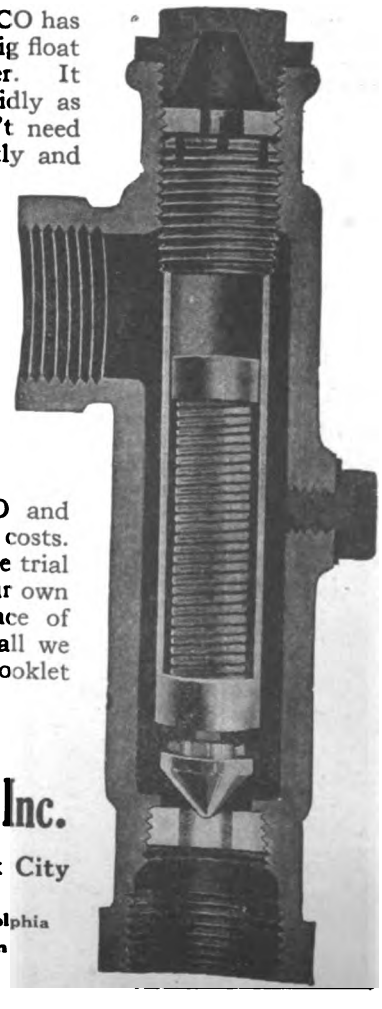
See What You Save on Steam trap SARCO



This diagram shows at a glance the big difference between the size and the price of the clumsy, cumbersome bucket trap and a simple, compact Steam Trap SARCO.

The difference in size and the difference in price are, as a matter of fact, cause and effect. For it is the larger size of the bucket trap—with its extra superfluous parts, such as floats, levers, valves, water gauges, bowls, toggles, and packing—that you have to pay the larger price for. It is the compactness and simplicity of Steam Trap SARCO that makes it possible for you to buy it for ⅓ the price of the bucket trap.

Rated size for size, SARCO has the same capacity as the big float trap. Its efficiency is greater. It discharges condensates as rapidly as it collects, consequently doesn't need to be large. It closes promptly and prevents all loss of live steam. Its compactness permits it to be installed in many places where there would not be room for a cumbersome bucket trap.



WHY, therefore, pay the LARGER PRICE for a bucket trap when it gets you neither increased capacity nor increased efficiency?

Use Steam Trap SARCO and save ⅔ of your steam Trap costs. Will send it on thirty days' free trial and let it convince you in your own plant, away from the influence of salesmen, that the SARCO is all we claim, and more. Write for Booklet R-5.

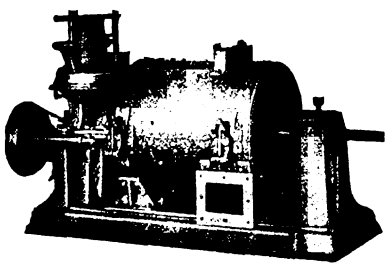
SARCO CO., Inc.

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Pulverized Coal



The Aero Unit System

of Pulverized Coal again demonstrates, as in other work of human endeavor, how an original idea at first worked out by complicated and costly methods is finally simplified and perfected until it becomes a part of our every day existence.

The Unit System reduces the equipment and therefore the cost to a minimum by placing the Aero Pulverizer at the furnace where the coal is fed to the machine undried and is exhausted therefrom directly into the furnace. There are no dryers, no storage or long lines of transportation for the powdered coal, thus eliminating the hazard of fire or explosion.

Each Aero Pulverizer is designed as a complete powdered fuel unit for one furnace. They are built in standard sizes ranging from 600 lbs. to 5000 lbs. of coal per hour.

Bulletin Sent on Request

AERO PULVERIZER COMPANY

165 Broadway New York

(Continued from Page 59)

The use of white paint in diffusing light in the workroom has become recognized as a most satisfactory method of lighting the workers' room. White ceilings, and in many cases white walls and machines, have prevented many accidents and the light from this source is highly important. The illustration shows how the paint is applied to the walls. There are firms who have a man who has nothing to do but to keep the walls and ceilings painted white. With the equipment shown it is not a long task and the results are well worth while for any firm to undertake.

Confidence Constitutes Loyalty

(Continued from Page 22)

welfare of the employe is not the business of the management, in other words, when a business is conducted on what is called "strictly business lines," there the rank and file will look askance at motives, rules and decisions, and assume an attitude of suspicion toward every act of the management.

Loyalty to an employer is of the same quality as loyalty to one's friend, and is nourished by the same attributes. Men, who by reason of superior qualifications, attain positions in life which gives them even partial control over the destinies of others, could well afford to give some of their time to a study of ways and means, whereby their subordinates would realize the desire of the management to be fair and thoughtful of them in all things. Confidence in this constitutes loyalty. It must be earned.

Instructions Versus Orders

(Continued from Page 23)

your heart's content, but pass correction through instructing in ways and means of elimination. Criticising constructively makes one become the right kind of an instructor. Many cannot distinguish between instructing and ordering. Remember that orders usually lack explanatory reasons, and go a long way upon pure assumptive powers only. Always deal with the Foremen in a large way. Be charitable, but hold to business so that they in turn may conduct themselves properly towards their subordinates. Build their confidence in you by helping them to build confidence in themselves. If a man thinks but nine-tenths of the way through a problem, coach him through the other tenth. After he limps through let him know you are pleased. Such proceedings help toward making both bigger men. Even though the solution is easily worked, try to refrain from making too light of it. Not to do so is usually accepted as belittling, and this in turn destroys the worker's confidence in believing the "Boss" really wishes to help him. Such reasoning may be erroneous, but is often felt as very real.

Eliminate the "I know it all" or "My way is the right way" spirit. Prove your point. To shut a man up because you are in a superior position doesn't change his mind, and is a poor way to gain his confidence in believing that you are right. Confidence will never grow when overcast by such shadows, and men become extinct geysers from which nothing flows. They feel the lack of confidence placed in them, and in turn lose their initiative in grasping a problem of selling confidence to the worker for the Management. Darwin said "Like beget like," and so it is. The good Sales Manager makes good salesmen, and good salesmen get the business. Make the foremen good salesmen.

Now is the time of all times to encourage men. If you have anything good to say, find time to say it. When business is good again he will not need it nearly so much, as there will probably be other pleasant things that will recompense him for your shortcomings in this respect—"tell him now."

Unless an action can withstand the light from all angles it is much better to keep it entirely covered. Half way ex-

(Continued on Page 63)

SKIDS

Jimmy—that's our office boy—is one of those snappy good looking kids they have down in the Street. He came in one Monday so I thought I would talk to him a bit and see what he knew.

I pushed my buzzer and waited—Jimmy appeared full of pep and a "Good morning, Sir." I thought to myself, here's a live one.

After some preliminary discussion, I asked him where he had worked before and why he left. He said "Aw they got the skids greased up over at ———and nobody ever gets a chance. They never give a guy a boost, always hire someone else and pretty soon another goes down the chute." We talked of other things a while and I sent him back to his duties.

All morning Jimmy's "They got the skids greased up" kept running through my head and I kept thinking of the increasing labor turnover we were having at our factories at—and came to the conclusion that our skids needed some grease taken off.

We got in touch with an operating organization in New York that has a world wide reputation in operating and engineering matters and you would be surprised the tremendous losses they showed us just because our "skids were greased." They studied our employment problems, the department heads, their methods and efficiently re-arranged several department organizations and in a very short time we could see the difference in our operating curves.

If you are up against operating problems you ought to get them to send a man out to talk to you. He will be able to show you a whole lot of interesting things and I'll bet you will be glad to have their ideas.

Just phone or write

THE MANAGER
23rd Floor,
43 Exchange Place,
New York City.

Phone Hanover 6076.

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HUNT

ELECTRIC MOTOR CARS
FAST—RUGGED—RELIABLE

For transporting bulk, bagged and cased material, single and double truck drives. Can operate on 12'-0" radius curves. Manufactured to operate on third rail and single and double overhead trolley systems.

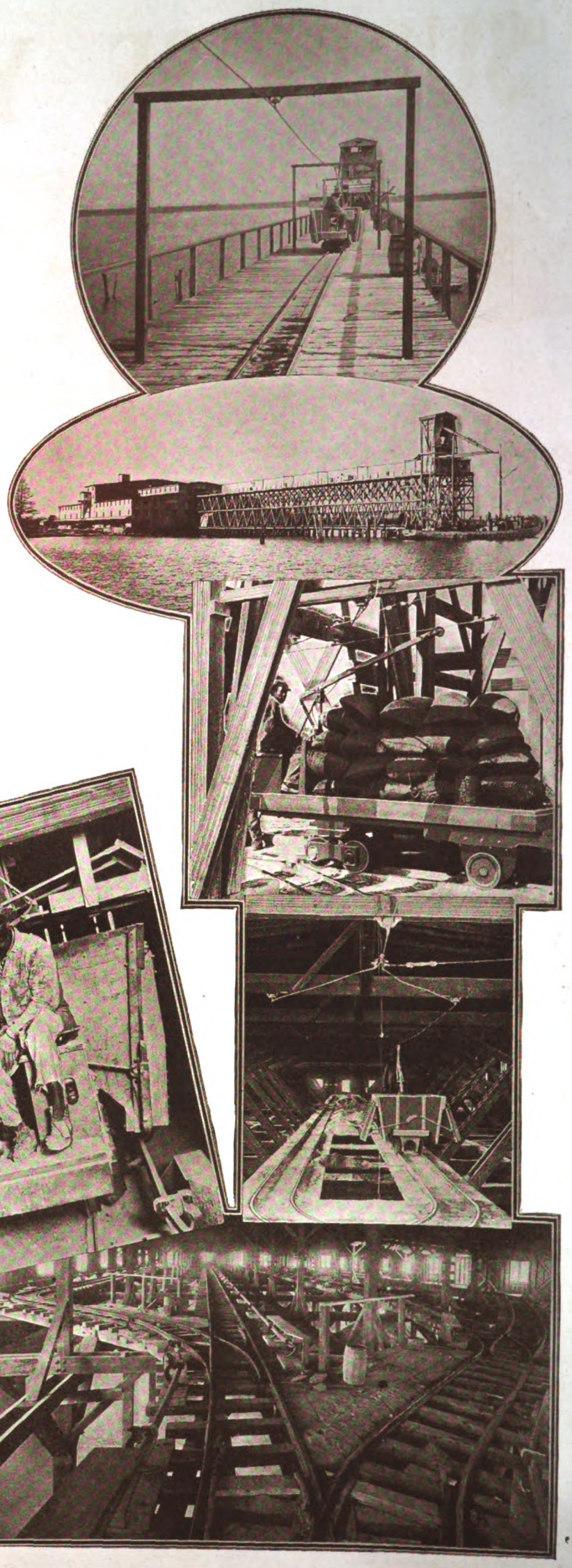
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WEST NEW BRIGHTON, NEW YORK

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Ernest F. Learned
141 Milk Street
Boston, 9 Massachusetts

Phillips, Long & Co., Inc.
538 South Dearborn Street
Chicago, Illinois

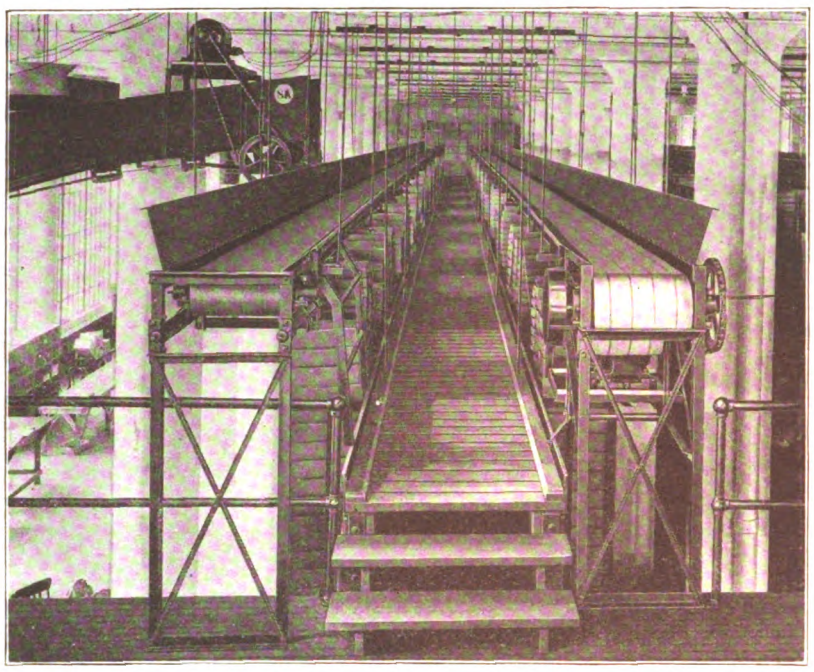
James P. Mewshaw
710 Fourteenth Street N. W.
Washington, D. C.



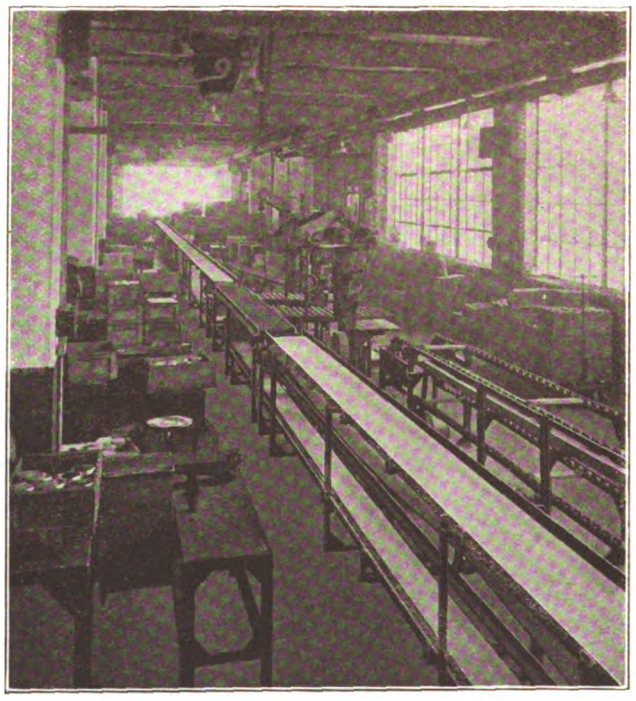
Typical Views of Hunt Motor Car installations in Fertilizer Plants.

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SURPRISE YOU---INDEED



National Cloak & Suit Company installation



American Can Company installation

it will surprise you to know what it has actually cost you to handle your materials in the past year. To get just an idea of the money which is being wasted through lax methods of handling materials in your plant go into each department starting in the receiving and finishing in the shipping. Make notations of the methods used, amount of time consumed to carry articles to and from given points and draw your own conclusions as to why your handling costs are high.

Conveying Systems Solve Handling Problems

We will gladly make an analysis of your handling problem and submit design of a conveying system particularly adapted to your individual conditions which if installed will reduce your costs, increase efficiency of your organization and enhance your production.

Resolve immediately that your 1922 handling costs will be substantially reduced and to get action communicate with us immediately.

SAMUEL OLSON & COMPANY

2418-26 Bloomingdale Ave
CHICAGO ILLINOIS

5th Ave. Bldg.
NEW YORK CITY, N. Y.

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(Continued from Page 60)

planations leave the other half open to false interpretations. Do everything that is reasonable in breaking down so called "Mysteries." Many workers only view such things as a slight of their intelligence, or that one has a doubt of their trustworthiness.

The man who believes that he is able to "kid them along" only "kids" himself, and though apparently successful for a time is sure of a reaction that impairs confidence. The practice has a touch of unsincerity not appreciated by anyone after they wake up.

Impress the Foreman that he receives as much credit for his power of stimulating ideas from his workers as he does for personal originality. To give Credit where Credit is due, or by "rendering unto Ceasar the things that are Ceasar's," is an avenue through which one gains confidence.

A most discouraging practice is to permit "Joy killing" through enlarging some inconsequent thing about a job that has been well performed. Such a practice may show analytical powers, but it surely shakes the confidence and reduces the spirit put forward into the next job.

High wages will not fully recompense for a continual slight of these fundamental things which are inherent in every man's being, even though the degree is not exactly determined.

What Is Normal Business?

(Continued from Page 15)

of us from studying the activities of past depressions and recovery therefrom?"

"In its details," said the Colonel, "one business cycle has always differed from another and probably will continue to do so. But there are certain elements which are common to all cycles and these help to throw light on the future.

"It is theoretically possible for business to continue at a low level indefinitely. Low incomes result in low expenditures, and low expenditures in turn make low incomes.

"But, in practice, there are several things which always operate to bring about a business revival. A certain considerable amount of money is always being saved by thrifty persons, even during the worst of a business depression, and these savings create a growing pressure for an outlet in new enterprises and business expansion. Much construction work that has been checked by high prices during the preceding boom is always awaiting a favorable moment—a moment of low prices for material, low labor costs, and low interest rates—for a fresh start. Business men, generally, are always estimating price trends and will place orders for larger supplies of goods and for longer periods the moment they feel that the liquidation is complete and that prices are due to increase rather than to make further declines.

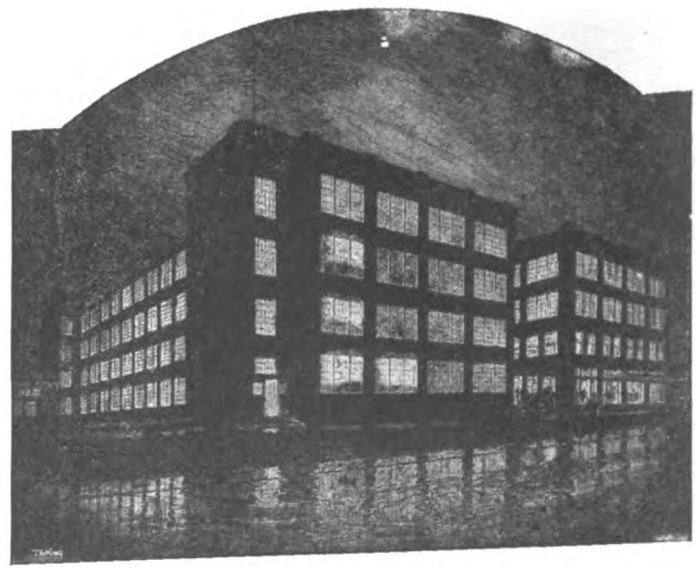
"Sooner or later, therefore, the vicious circle of low income and low expenditure is broken. Bank balances are drawn upon, new loans are made, and each day's expenditure is greater than the income of the day before.

"This process is cumulative. Merchants, who have delayed their purchases until they find prices on the up grade, buy liberally at these higher prices to avoid paying still more. The construction work begun by a few far sighted investors is supplemented by perhaps an even larger volume of construction—the building of new telephone lines, the buying of new railroad cars, and the extension of industrial plants—arising directly out of the increased business activity itself."

If these common factors of past cycles hold good in the present one it would seem from Colonel Rorty's analysis that we already have our feet pretty firmly planted on the upward path. But, granted that this is so, how can one determine a *normal* for his business at a given time. The normal of ten years ago is not the same as the normal of today,

(Continued on Page 64)

Plant of AMERICAN CAN COMPANY Toledo *designed by* "MRBN" *Engineers*



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(*Continued from Page 63*)

nor is the normal in June of one year the same as in December. If one could determine a fluctuating normal, so to speak, that would vary with good times and bad times and yet allow for the general growth of progress, it would be a handy thing to judge oneself by to determine if one was really slipping or making headway.

"How does one find out the 'normal' curve for his business," we asked Colonel Rorty.

"You are dealing with one of the most difficult problems of business statistics," he replied.

"The normal line, as we have used it in our work, represents for each month the volume of business which we should expect were our business operating at average activity. Allowance is made in the normal for regular seasonal variations and for the general upward or downward long period trend in our activities.

"With a normal so determined we can compare our actual business with this normal to see whether our activities, for any given month, show a volume above or below "normal." Likewise, we can compare the relation of our own business to normal with the relation of general business to normal, or of any other particular business to normal.

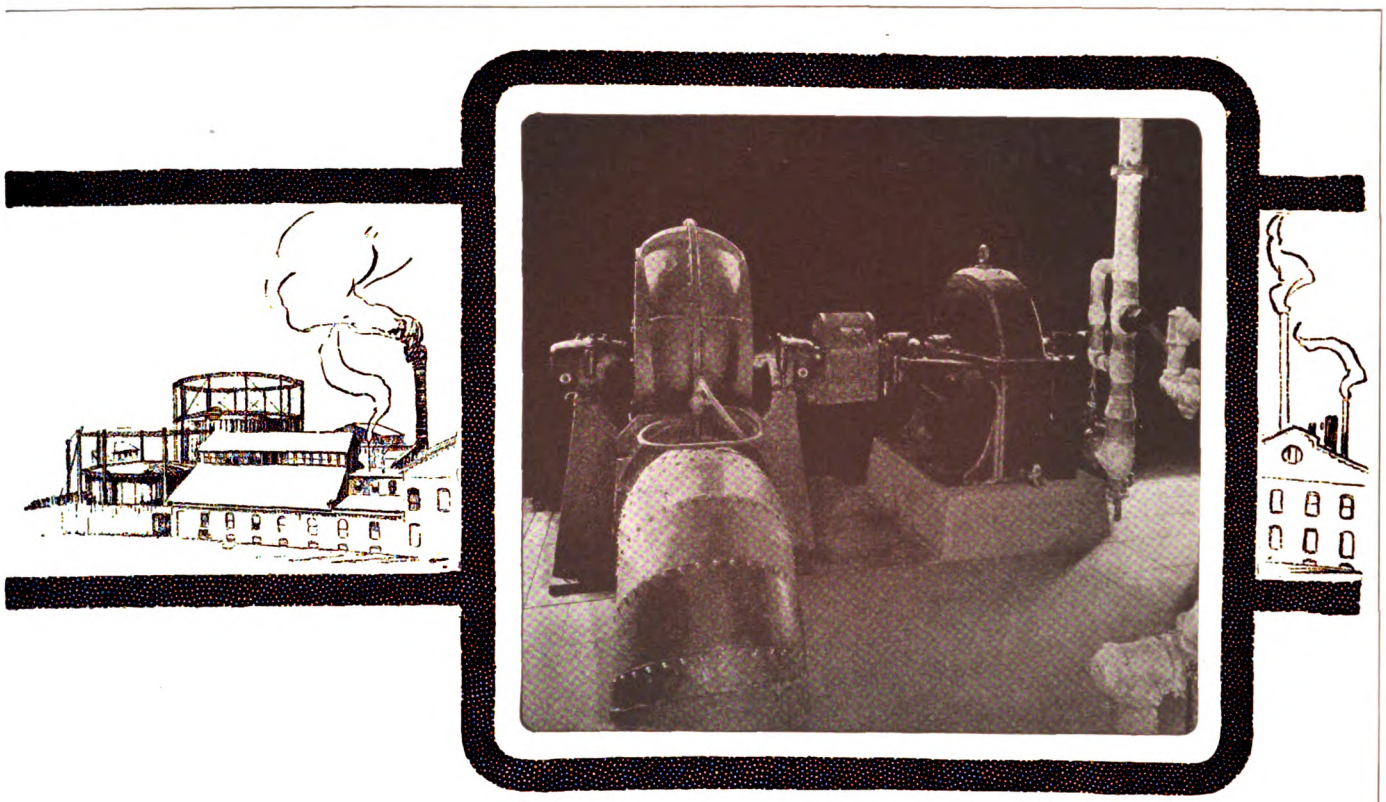
"In addition to this fundamental normal we work out units of standard deviation in such manner (following in general the methods developed by Professor Persons of Harvard) that an ordinary depression is indicated by a swing of our production line one unit below normal, and an average boom is indicated by a swing of the production line one unit above normal. In these units there is a measure of the normal expansion during a boom and the normal decline during a depression.

"A further point is that the determination of normals is comparatively easy for periods that are a number of years past, but the immediate normals are often very hard to determine and frequently require slight or considerable adjustment as time goes on."

"Can you tell us of a simple way," we asked, "that does not require many statisticians or much statistics, whereby the average executive can recognize a state of normalcy when he gets to it?"

"The status of employment," replied Colonel Rorty, "offers a very simple and dependable gage for this. You can be dead sure, for example, that when there is a pronounced unemployment—when good men can be gotten without trouble—that business is in a subnormal state. When, on the contrary, there is a marked scarcity of labor and you have to comb the highways for help, the condition is supernormal. When, however, there is neither a distinct shortage or a distinct abundance of available labor—when you can get good men by going after them hard enough, but have to go after them to get them—then you can assure yourself that business is normal."

And after all, Colonel Rorty's simple definition pretty nearly covers it when one is ready to admit that normal business means the full time employment of the normal labor supply.



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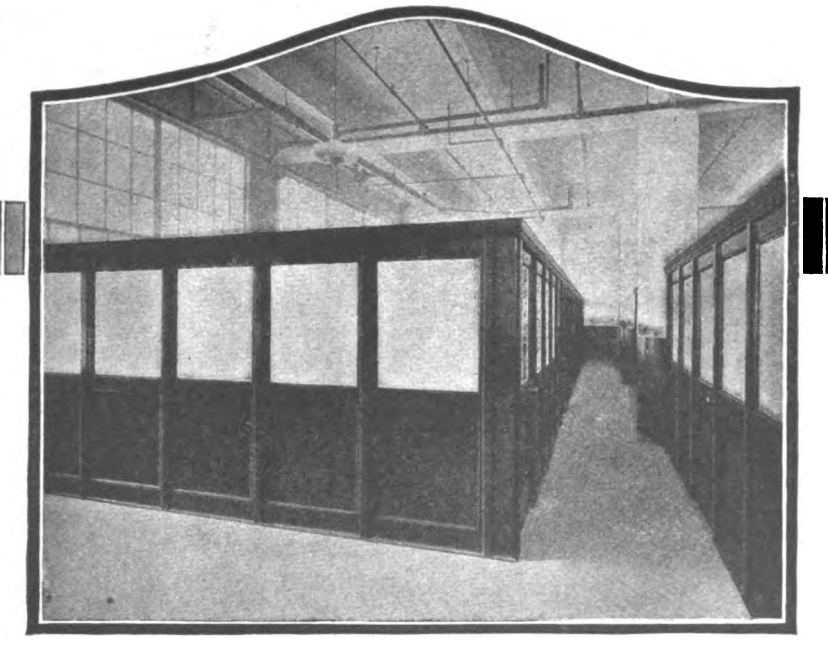
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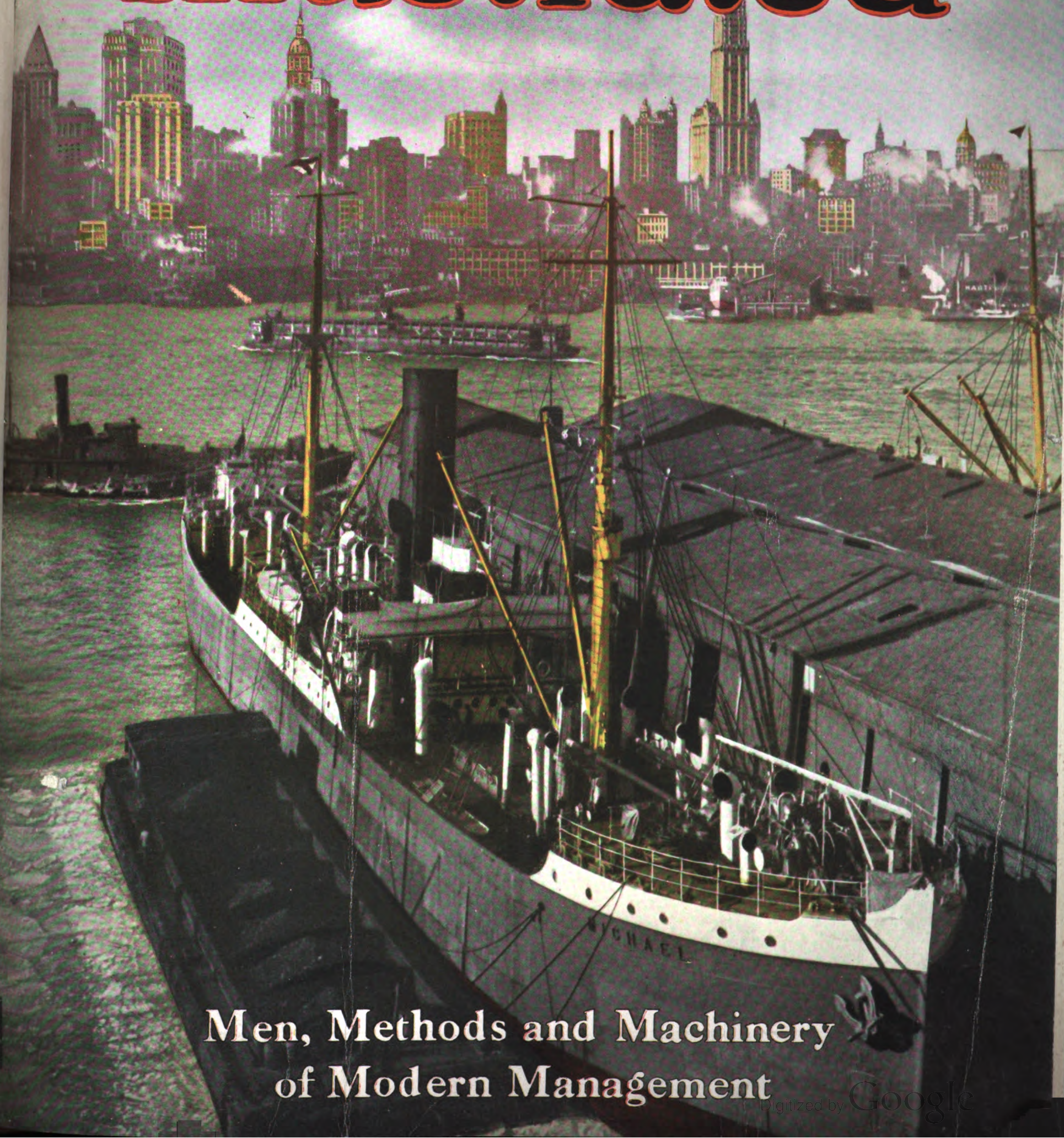
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Men, Methods and Machinery of Modern Management

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The Husky "Bluenose" Is Hyatt Bearing Equipped

A two wheel truck leads a rough life—this "Bluenose" truck with its all-steel frame and its sturdy steel Hyatt Roller bearings is well prepared for such a life—prepared to give years of the hardest service.

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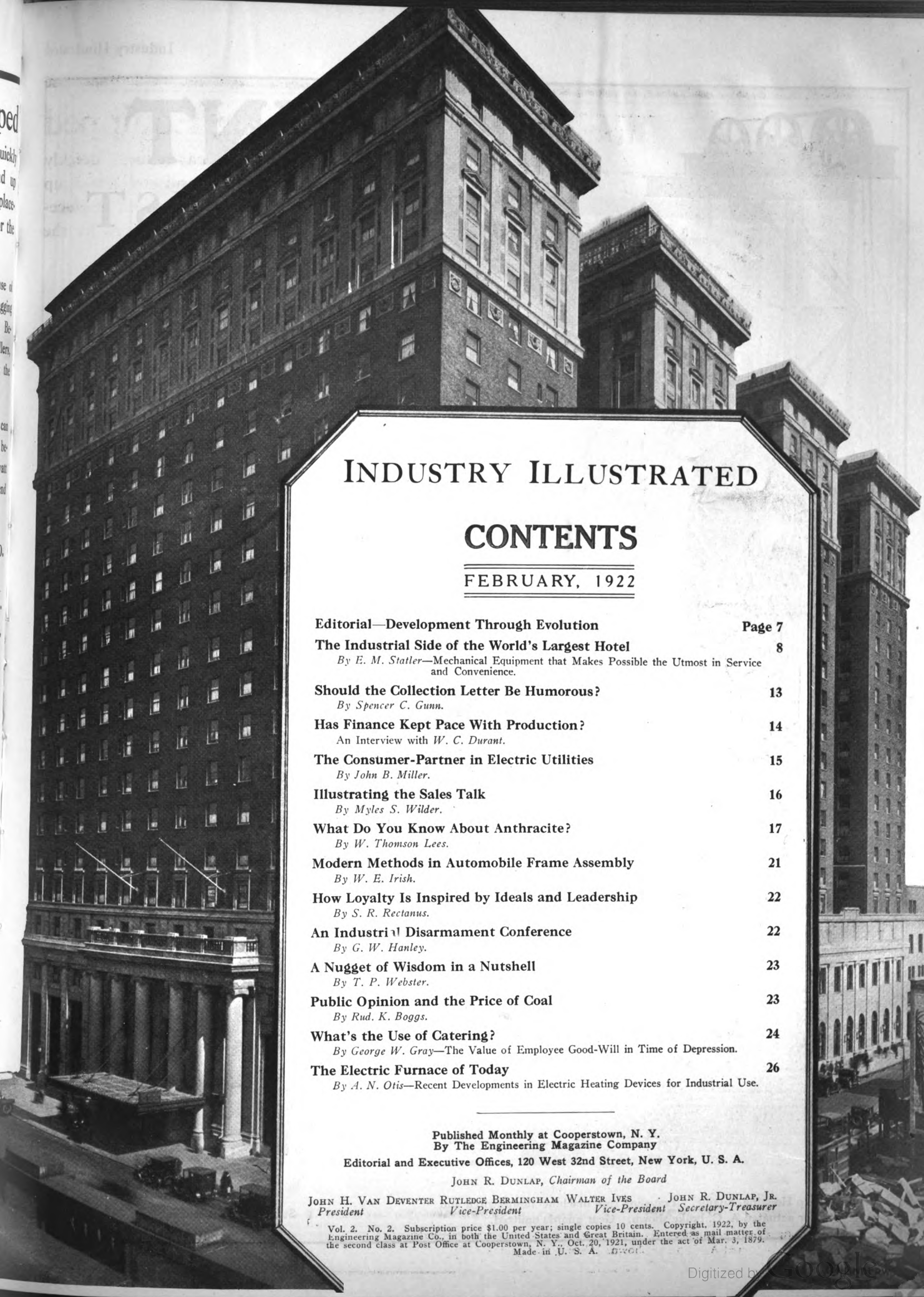
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BULLETIN 125

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INDUSTRY ILLUSTRATED

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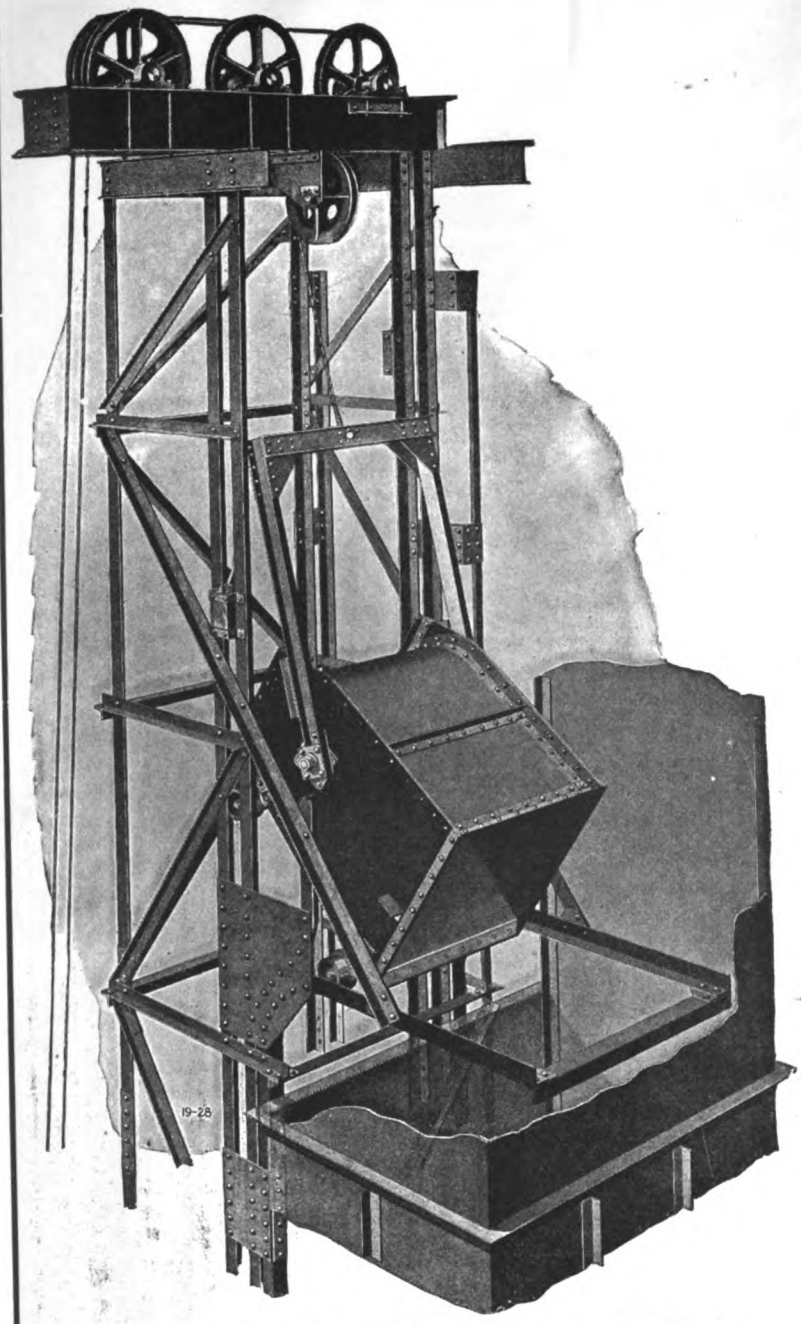
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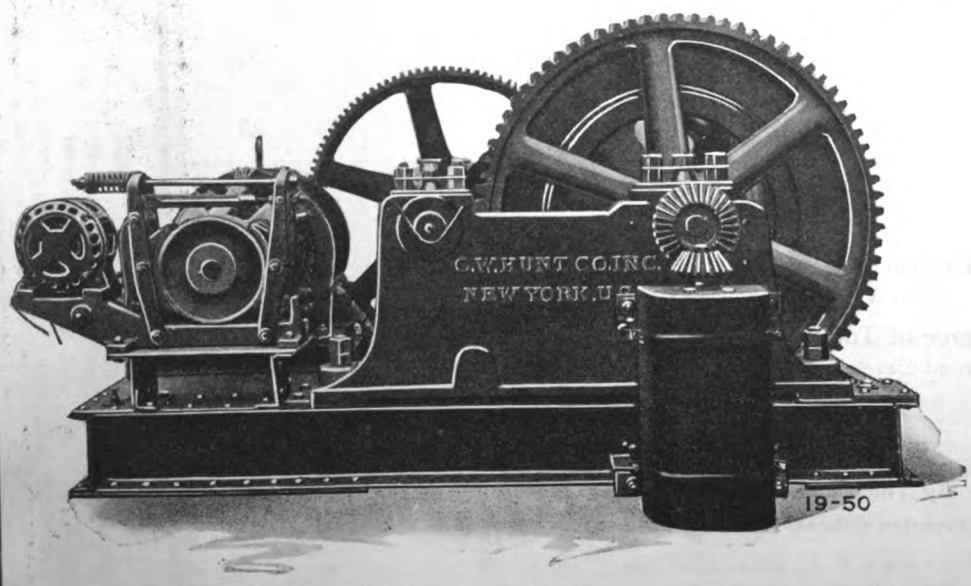
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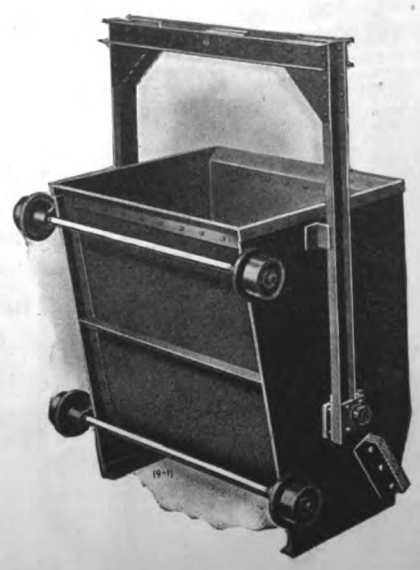
Standard head frame for single counterweighted skip. Bucket shown in dumping position over chute or hopper, counterweight partially bottomed. The double leads at the left are direct to the hoisting engine.



Coal and Ash Skips for Gas Producer House of a large Steel Plant.

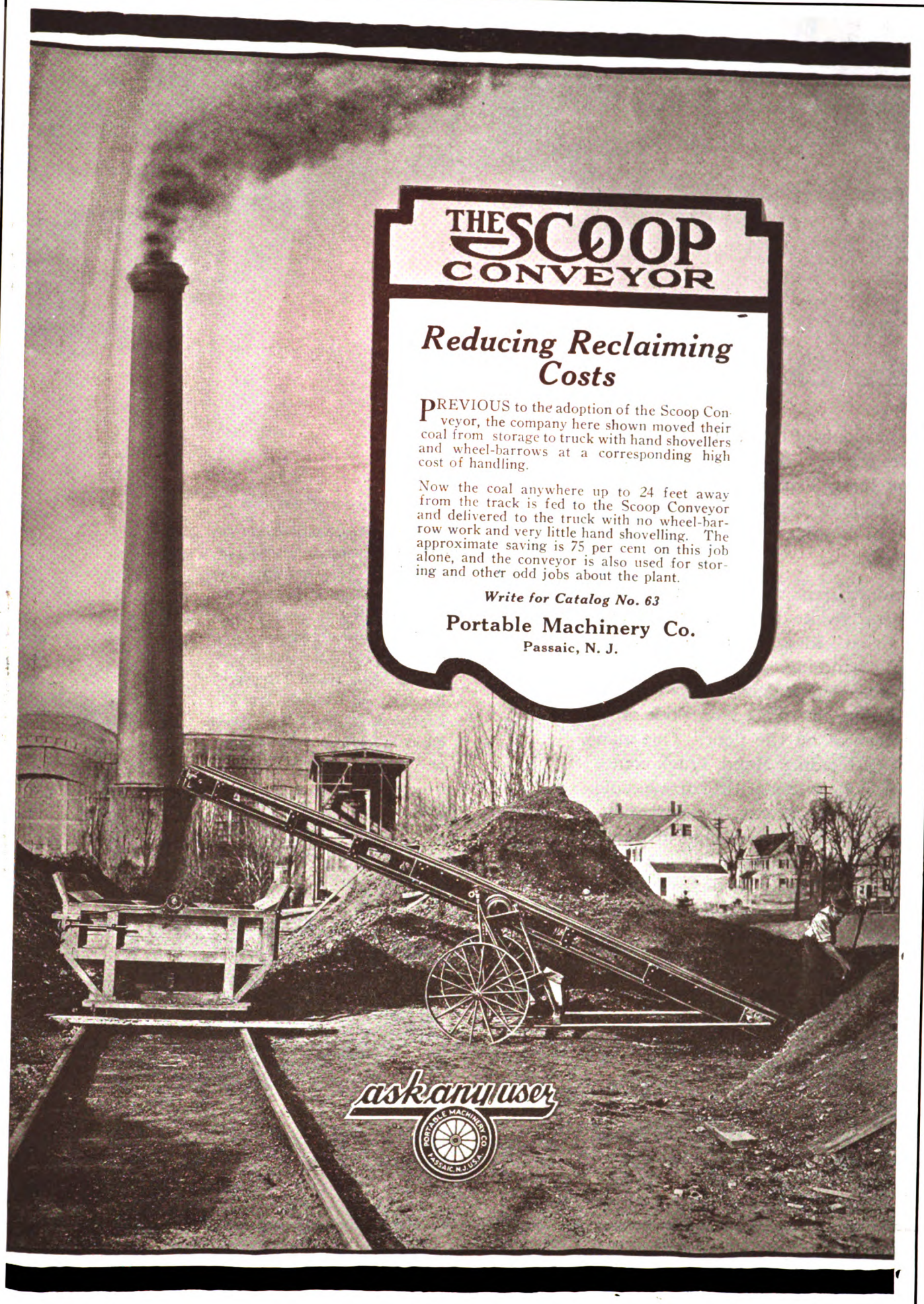


Standard Skip Hoisting Engine. Traveling cam machine limit switch and motor actuated A. C. brake shown. Gear guards omitted.

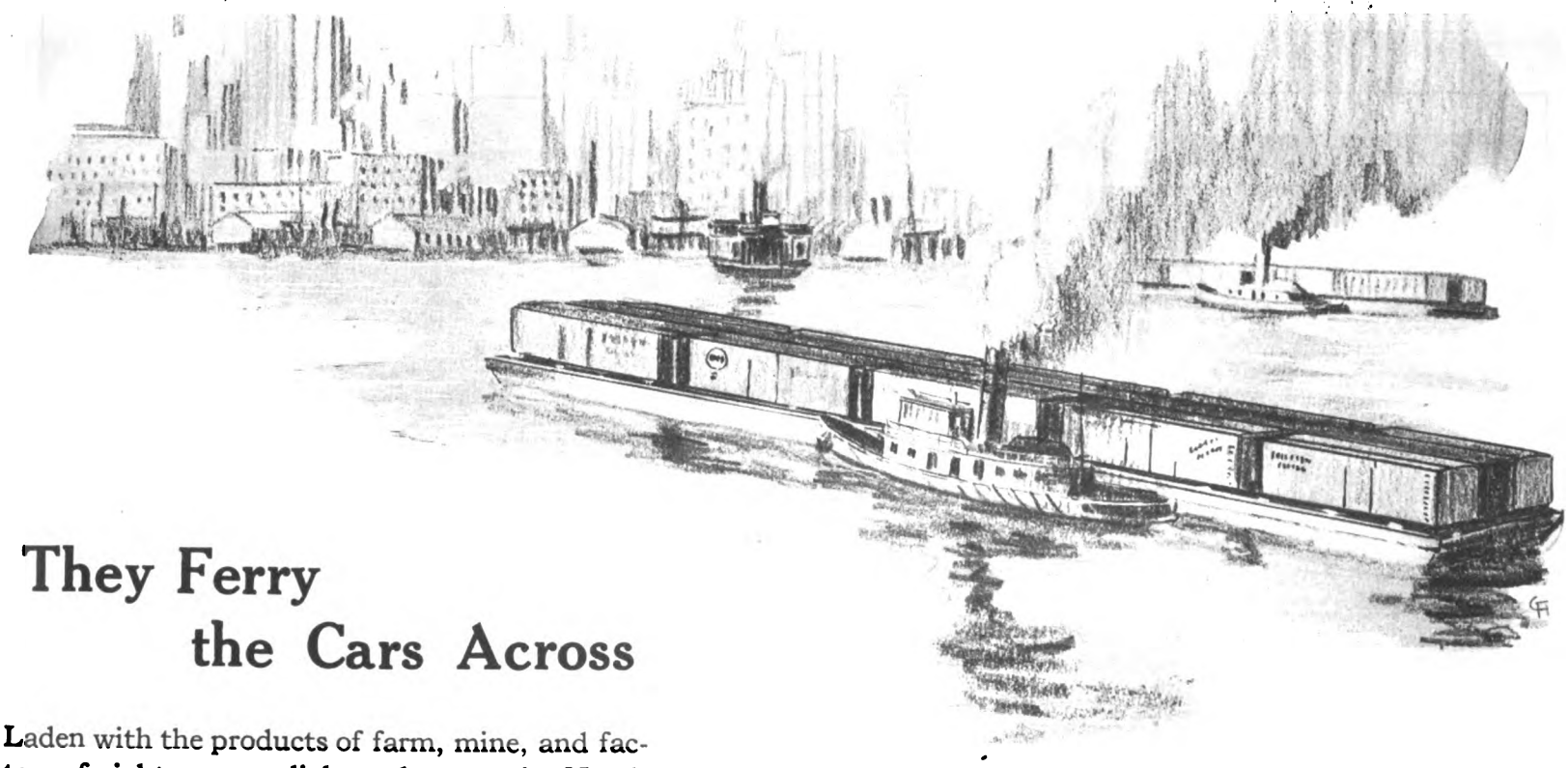


Standard Skip Bucket

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Industry Illustrated

John H. Van Deventer, Editor

W. Thomson Lees, Associate

Reginald Gordon, Associate

EDITORIAL

Development Through Evolution

SCIENTISTS tell us that, thousands of years ago, all life on this globe was amphibious; that, as the water receded, it left many of these water-dwelling creatures on dry land.

The more venturesome of these tried to use their feeble, rudimentary legs as a means of locomotion; and in the course of time their descendants developed appendages suited to the purpose. Until, through the ages, new species were developed, with new faculties—culminating in the highest type, Man.

In this age-long process through which man was evolved, these scientists maintain that every step forward is marked by the operation of a basic law of nature; those groups or individuals which make no effort to adapt themselves die off; those which adapt themselves only imperfectly survive but make no advance; those few which not only adapt themselves, but try to master their new responsibilities acquire new powers and reach a higher stage of development.

Whether we accept or reject the Theory of Evolution as explaining the origin of man, there is abundant evidence that the evolution of the individual, during a single life-span, is governed by some such basic law.

We know that the blacksmith, through constant use, develops arms of abnormal strength; that the runner develops leg-muscles far stronger than the average; that the pianist's fingers become marvelously strong and dexterous.

But what is true of our bodies is equally true of our minds, and the brain is far more plastic than the skeleton and muscles. We cannot acquire a third hand merely by striving; but we can acquire seemingly new mental faculties, because these faculties lie dormant in all of us, awaiting development.

Statler, the bell boy of forty-five years ago, who today operates five of the most modern hotels; Ford, the bicycle-repair mechanic who created the world's largest automobile manufacturing concern; Edison, the one-time telegraph operator, who gave us the incandescent lamp and the phonograph; James J. Hill, former shipping clerk, who created the Great Northern Railway—each of these men, at the outset of his career, faced the same limitations and opportunities as those other thousands of contemporary bell boys, repair men, telegraphers, and shipping clerks.

The essential difference between these men and those others is the same difference that science tells us accounts for the origin of species. Where some of their fellows failed to adapt themselves, and fell back; where others adapted themselves but imperfectly, and failed to reach the heights; these few men *studied* their environment, *adapted* themselves to it, *mastered* each new responsibility—and in the process, acquired new faculties and new powers which carried them ever higher.

All the "luck" and all the "pull" in the world do not weigh one snap of the fingers in comparison with the attitude of mind which recognizes—and uses—the laws of conscious evolution.

Additional copies of this Editorial will be furnished on request

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The Industrial Side of the

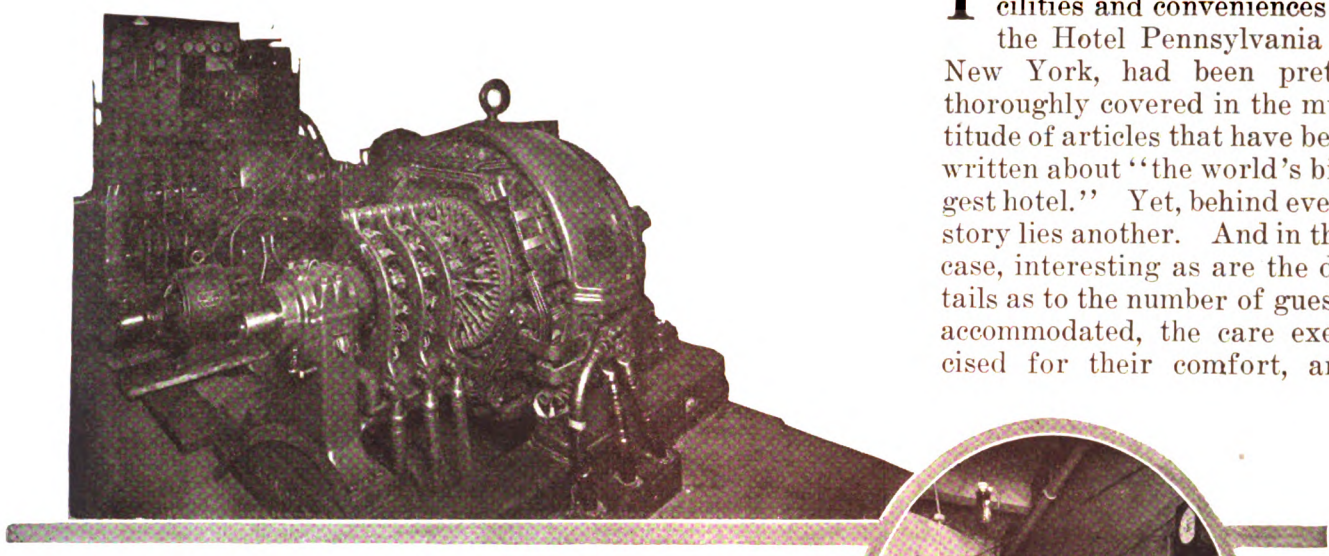
Mechanical Equipment that Makes Possible

BY E. M.

IT might be said that the facilities and conveniences of the Hotel Pennsylvania in New York, had been pretty thoroughly covered in the multitude of articles that have been written about "the world's biggest hotel." Yet, behind every story lies another. And in this case, interesting as are the details as to the number of guests accommodated, the care exercised for their comfort, and so on, few people have the faintest conception of the mechanical equipment necessary for the rendering of the kind of service upon which the Pennsylvania prides itself.

The human element is, of course, the vital factor. But without mechanical aid, the human element could not function; lacking elevators, no hotel could grow to the height of twenty-two stories; lacking refrigerating equipment, no hotel could care for the varying gustatory needs of thousands of human beings every day. And the growth of the necessary mechanical equipment has had to keep pace with the advancement in standards of comfort, until today the modern hotel may be truly described as a city within a city. A city complete unto itself; with its own freight, express and passenger service; its own cold storage plant, water system, heating system; its own carpenter shops, machine shops, paint shops, and so on.

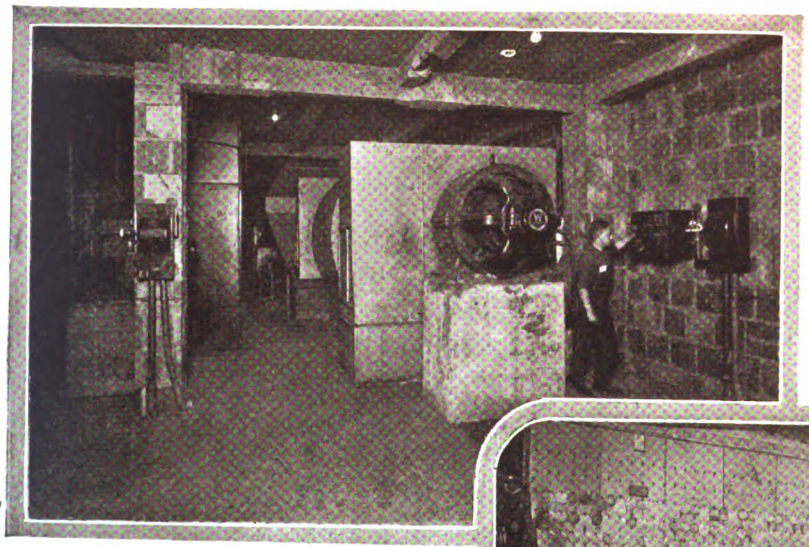
Consider, for example, the single item of cooled drinking water. We believed that guests would appreciate the convenience of having ice water on tap in every room, instead of having to ring for it. A simple enough idea, on the surface—but only on the surface. Because, to carry it out, involved installing special pumps and compressors of enormous



Twelve thousand kilowatt hours of current each day are required to light the hotel. Five hundred and fifty miles of insulated wire carry the current to all parts of the building.



Below—The locksmith is subject to many emergency calls in the course of a month.



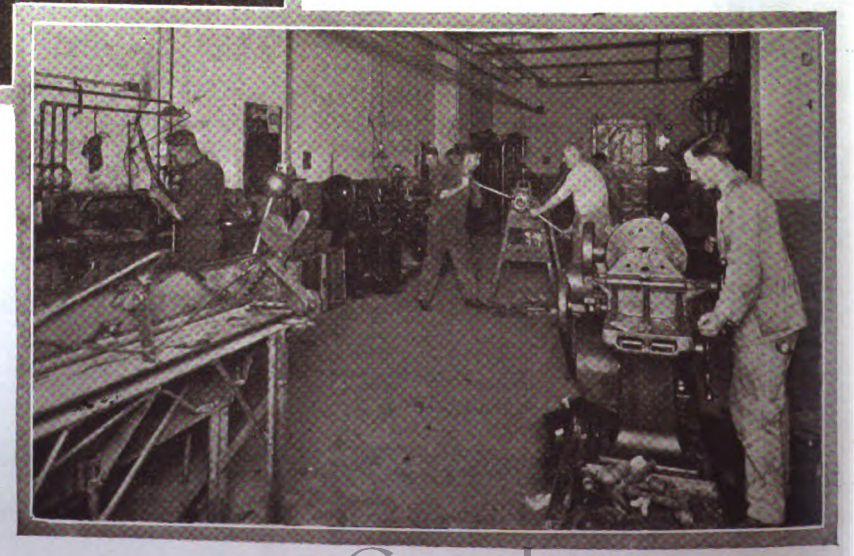
The ventilating equipment requires much valuable space, but healthful fresh air is considered well worth it.



Below—Mirrors, picture frames, furniture; these things require a vast amount of painting, varnishing or gilding, to keep them in repair.



Below—A fully equipped machine shop is needed, to avoid breakdowns in the engineering department, which is the real backbone of the structure of service.



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World's Largest Hotel

the Utmost in Service and Convenience

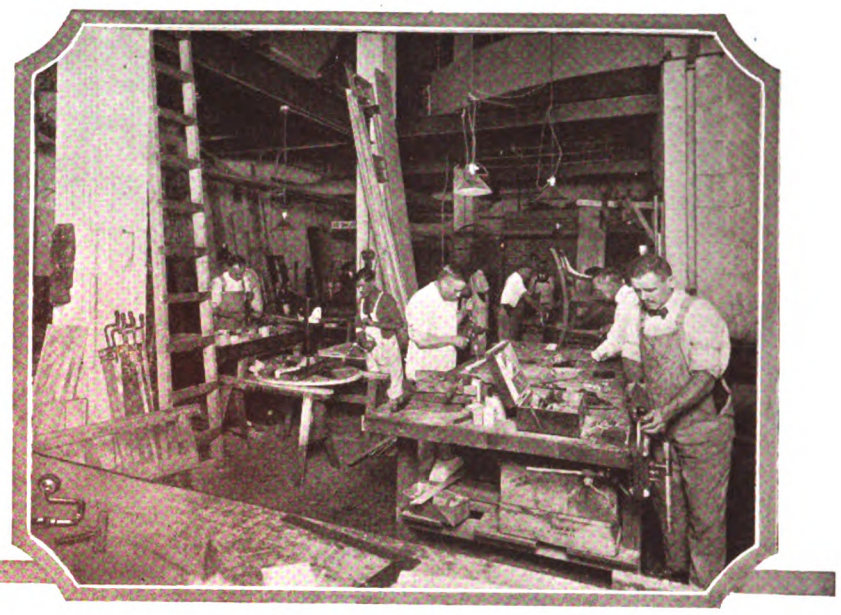
STATLER

capacity so that the water on the twentieth story should be just as cool as that on the second or third. It involved, moreover, a system of insulated piping which is an engineering feat in itself.

Including all kinds of plumbing pipes, there are just a little less than 600,000 feet—one hundred and eleven *miles*—of piping in the hotel. For electric lighting and power service alone, there are five hundred and fifty miles of insulated wire. Eighteen thousand electric light bulbs are required for lighting, and the current consumed for this purpose amounts to twelve thousand kilowatt hours per day. With the world's largest private exchange, serving 3,340 telephone instruments, seventy operators are required to handle the average twenty-four-hour volume of seven thousand calls.

In the kitchens, the big soup kettles are heated by steam; the other cooking is done by gas—of which, incidentally, we use some fifty thousand cubic feet daily. On the average day, we serve between eleven and twelve thousand meals, 8 a minute for every hour of the 24. In addition to the cooking, this volume necessitates adequate cold-storage facilities and dish-washing equipment. The latter is a comparatively simple problem, through the use of several large-capacity dish-washing machines, while the refrigerating equipment supplies not only cold-storage, but cools the drinking water, cools the air for summer ventilation, freezes some four hundred gallons of ice-cream daily, and makes all the ice required. To perform all these functions, we needed a large capacity, and our refrigerating ca-

(*Continued on Page 12*)



Aside from repairs, the carpenter shop is equipped to build drawers, partitions, benches, and all the odds and ends of a similar nature that constantly crop up.



A section of the electrical supply and repair department. The 18,000 electric light bulbs in themselves, require quite a little attention.

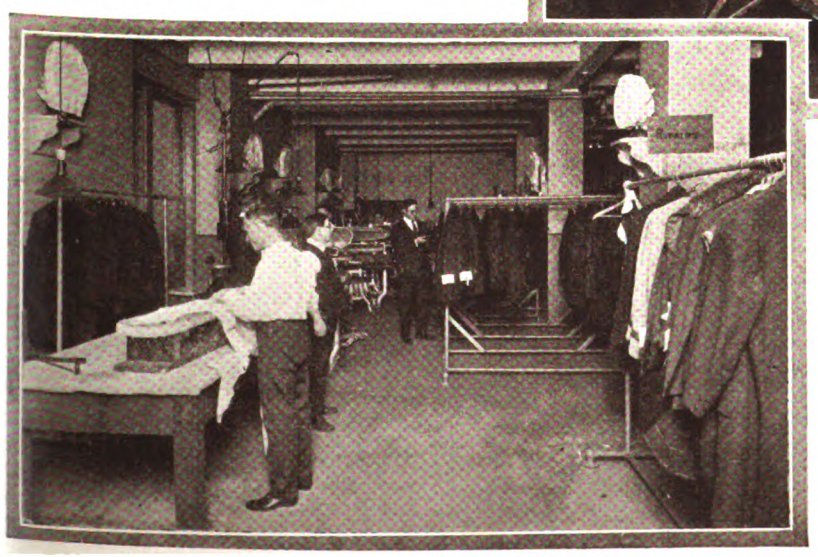


The upholstering shop is kept busy recovering furniture and renewing springs that break under the strain. Big savings are effected by prompt attention to these little details.

Below—One corner of the printing plant, which handles not only menus and programs, but prints a daily newspaper as well.



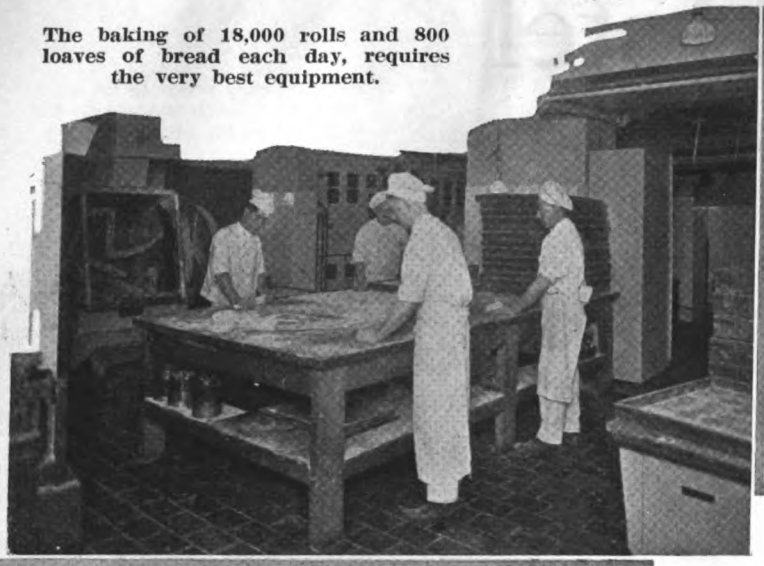
At the right is the upper level of the electric baggage conveyor, which enables the guest to get his trunk on shortest notice. Below, is a section of the tailoring shop, equipped with every modern device.





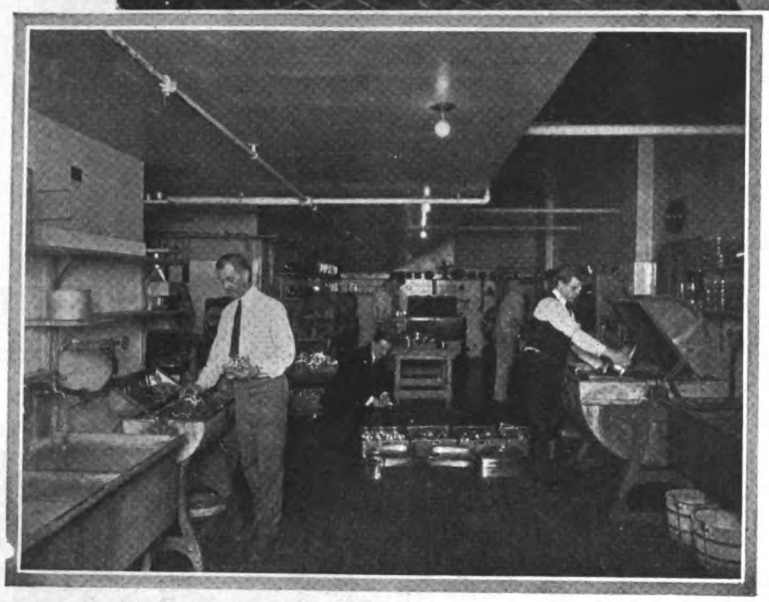
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The baking of 18,000 rolls and 800 loaves of bread each day, requires the very best equipment.

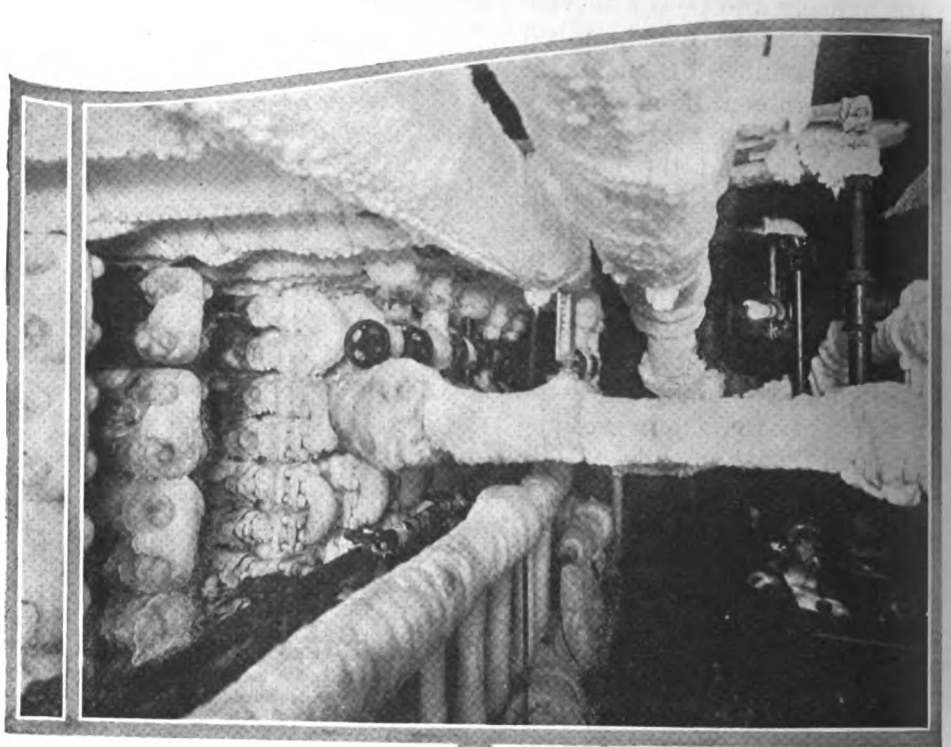




400 gallons of ice-cream are made daily in this department. This is one of the things made possible by the large-capacity refrigerating system.



Where 15,000 pieces of silverware are polished daily in special machines.



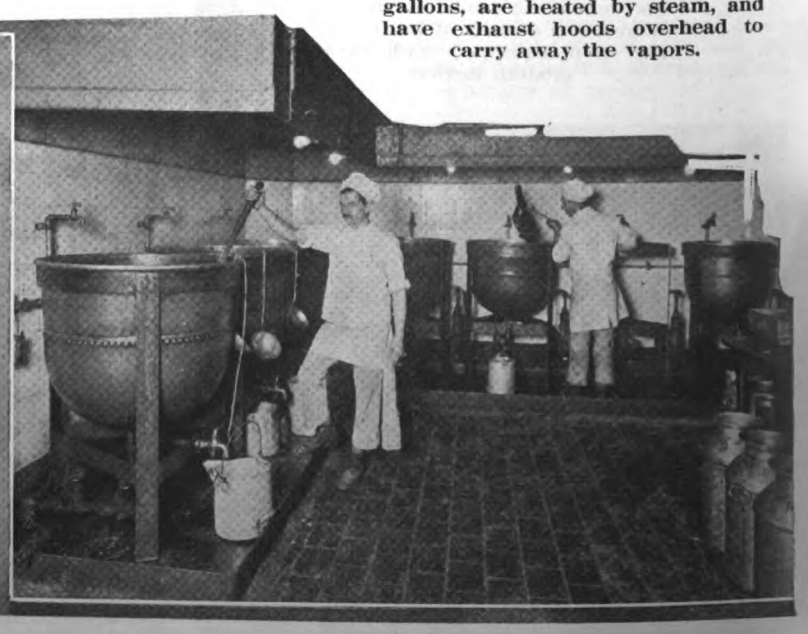
Part of the brine-circulating pipes of the refrigerating system. The brine circulates at a temperature close to zero.



Note the overhead roller conveyor which brings soiled dishes down. After washing these are sorted and delivered to their respective storage compartments.

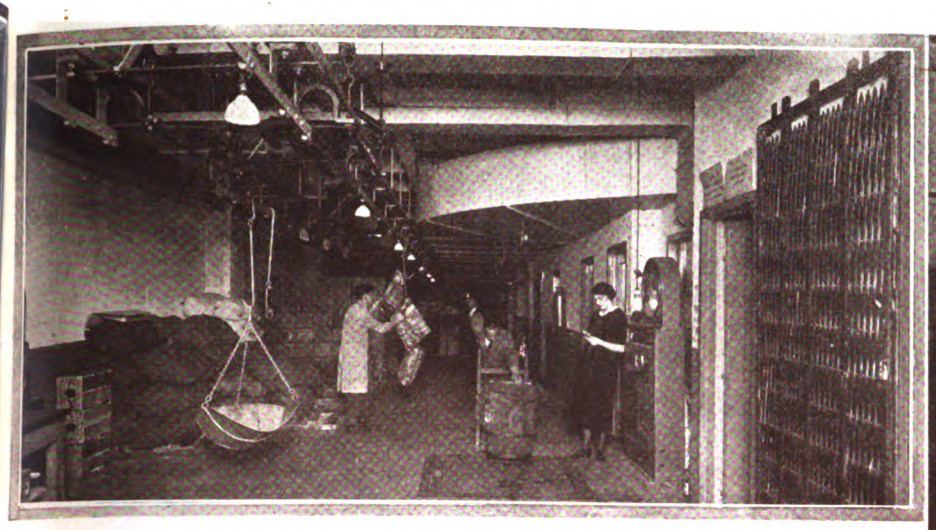
These big copper stock kettles with a capacity of one hundred gallons, are heated by steam, and have exhaust hoods overhead to carry away the vapors.



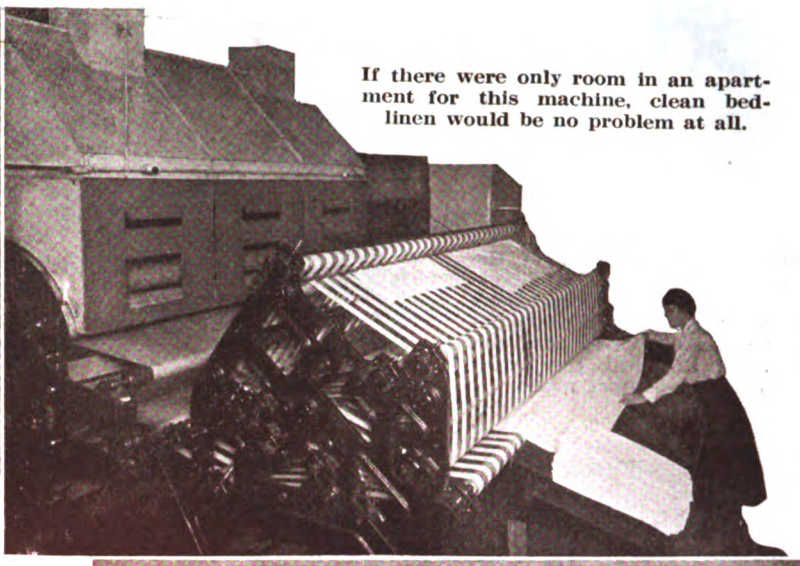


At the right—the pastry department. 250 pies and thousands of cakes and pastries are made here every day. Note overhead the section of conveying system.

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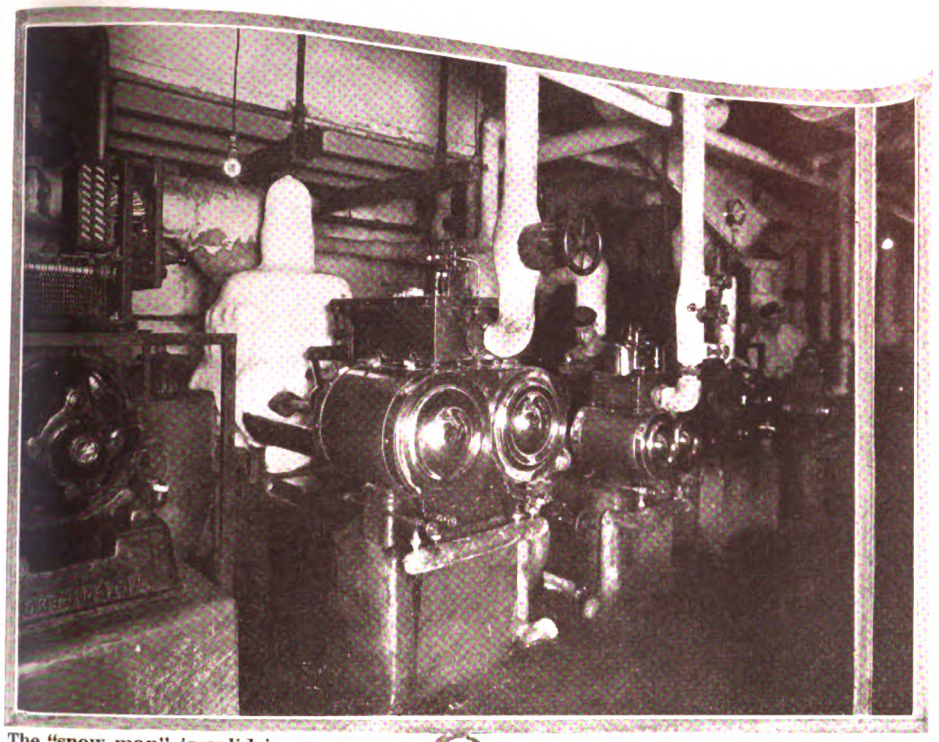
Overhead trolleys simplify handling of bulk food-stores. Platform-scale makes it easy to check the weight of barrels of sugar, flour, and the like.



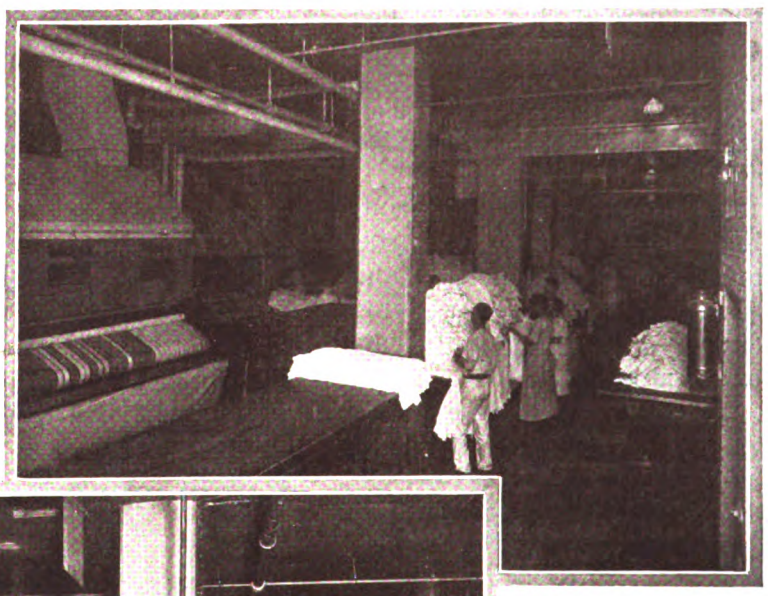
If there were only room in an apartment for this machine, clean bed-linen would be no problem at all.



Keeping the towels, sheets, table-cloths, and so on, in repair requires the services of a dozen women, sewing by hand and by machine.

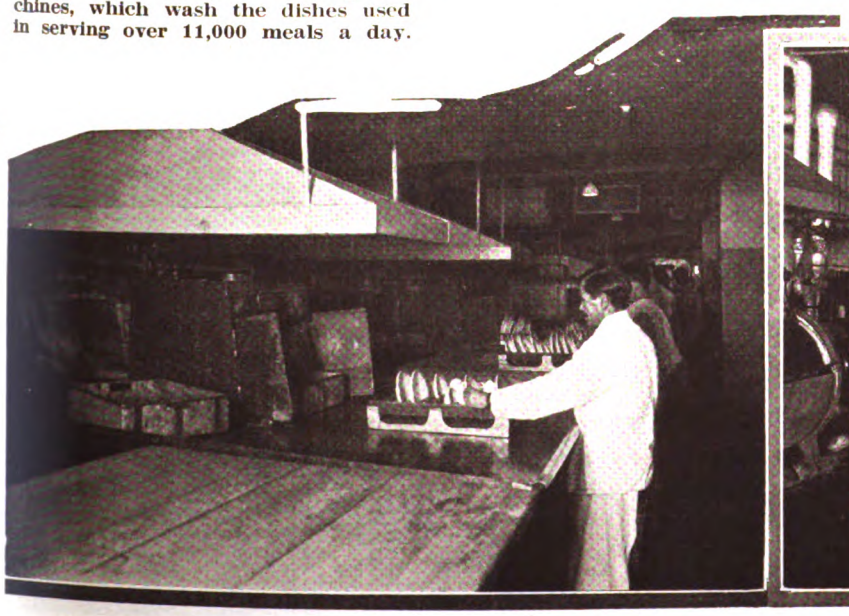


The "snow-man" is solid ice encasing the largest of the ammonia compressors. The room temperature, incidentally, is 80 degrees above zero, often above 100 degrees.



A corner of the house laundry, where house-linen is washed. The ironing machine at the left, is shown in greater detail at the top of this page.

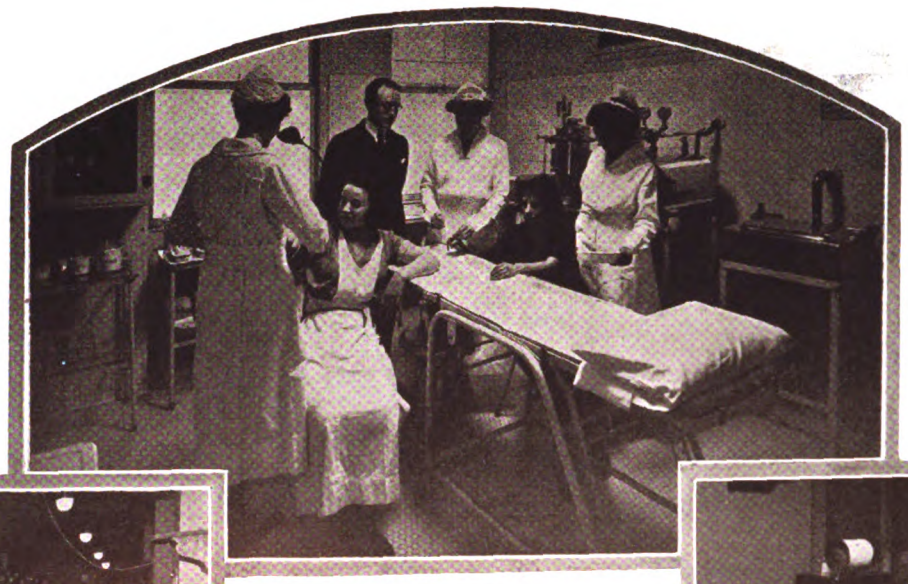
One of a battery of dishwashing machines, which wash the dishes used in serving over 11,000 meals a day.





A part of the general laundry, washing machine section. A day's wash amounts to 45,000 pounds.

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Below—A partial view of the world's largest private telephone exchange, where seventy operators are required to handle a 24-hour volume of seven thousand calls. In the oval (center of page) is the operators' rest room.

Below—All told, one hundred and forty telautographs are required to take care of telephone messages left for guests, to take orders for food to be served in the rooms, and to keep the Reservation Department advised of room changes.



Above—An up-to-date hospital is part of the necessary equipment, with operating room where major and minor operations are performed. This is situated on the tenth floor, away from noise and confusion.



(*Continued from page 9*)

pacity is one hundred and twenty-five tons of ice per day.

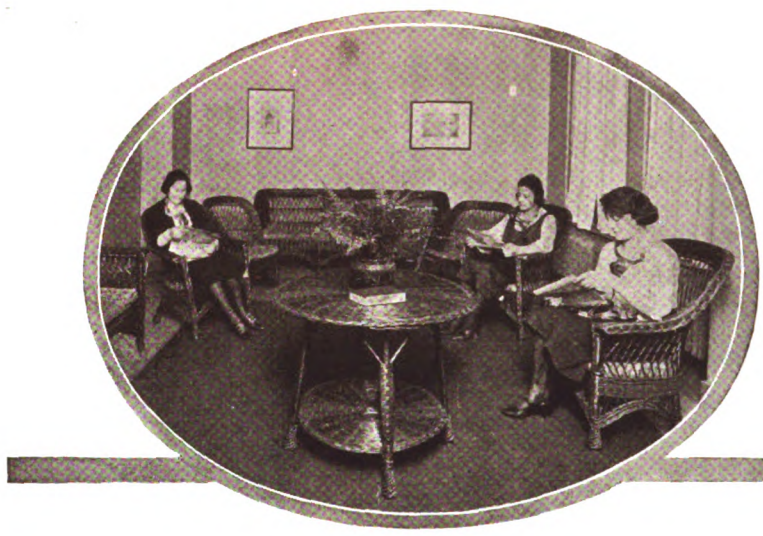
Our paint department keeps 30 men constantly employed, refinishing and gilding portable articles, and doing the interior painting necessary to upkeep. Adjoining the paint department is a fully equipped carpenter and woodworking-shop, where at the present time more than a score are fully occupied. Close by is the upholstering shop, where upholstered furniture is renovated and kept in repair.

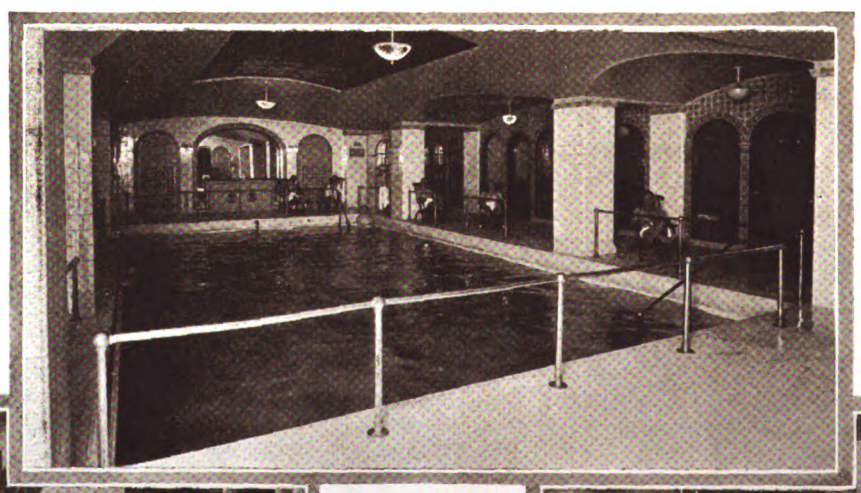
We maintain our own printing plant, where we print menus, programs, notices, and also a daily newspaper giving current hotel news and events of interest to guests.

Down in the basement is a laundry, with every modern device in the way of washing machines, drying machines, ironing machines, with a daily output of forty-five thousand pounds of laundry.

The engineering department, in the sub-basement, is a story in itself, with its dynamos, pumps, compressors, ventilating fans and ducts, switchboard panels—requiring a fully equipped machine shop to keep things in trim.

Perhaps this sketchy outline—in conjunction with the accompanying illustrations—is enough to show that our "city within a city" embraces a sizeable mechanical equipment. Off-hand, I can think of but one kind of machinery, associated with the running of a city, which we lack. We have no political machinery.





At the right, is the men's pool, adjoining the Turkish bath. A special filtering system keeps the water pure. Below, is the lost and found department.





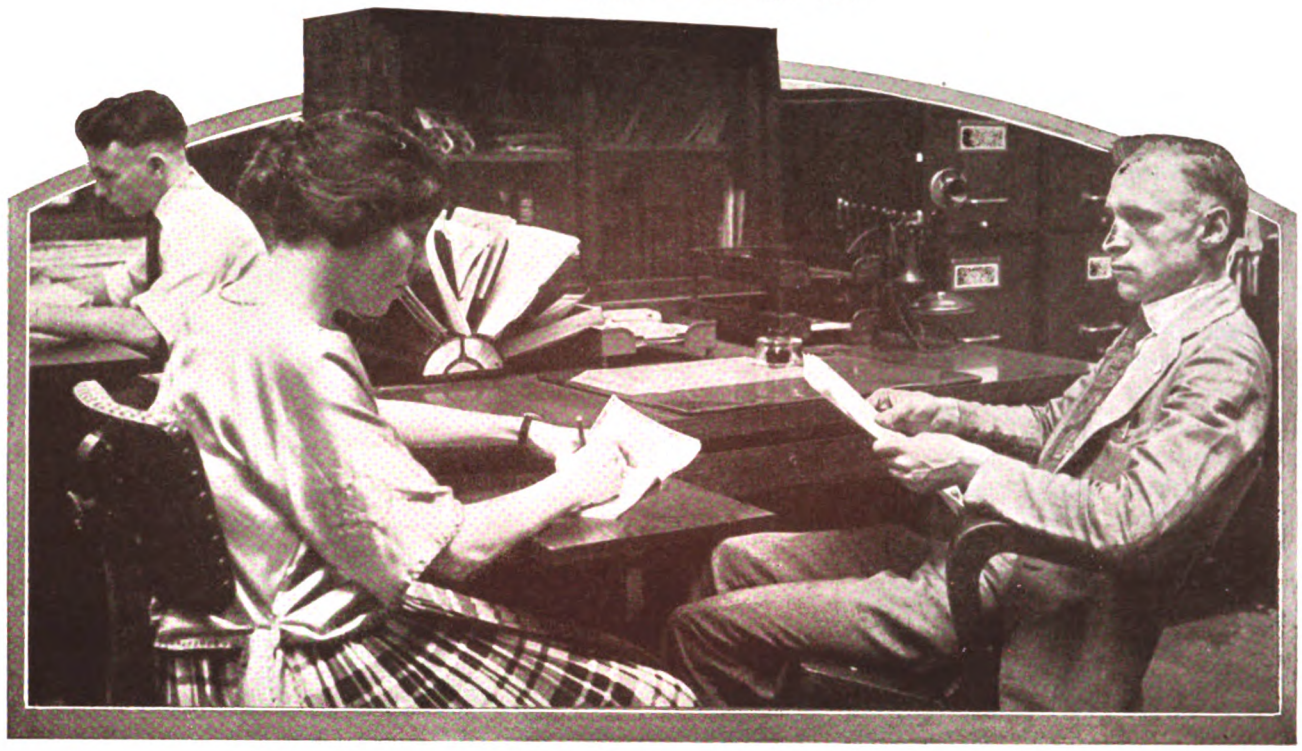
Below—With pneumatic tubes to the kitchen, telautograph connection with the telephone exchange, and automatic dumbwaiter control, meals are served in the rooms promptly and without error.

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Should a Collection-Letter be Humorous?

By Spencer C. Gunn

(Credit Manager, A. P. W. Paper Co.)



JIM—is a friend of mine. He is the owner of an overall factory, also Credit Manager, et cetera. He wrote the letter which I am assuming he has mailed from Tacoma to a customer of his in Jacksonville and he has been trying to convince me that we should use this sort of letter ourselves:

Dear Mr. Smith:

Why don't you send us a check? Have you got writer's cramp from figuring your profits of last year or are you too tight to buy another ten cent bottle of ink?

Our bank balance is so small that it got lost day before yesterday and our bookkeeper had a devil of a hunt for it. And the last time I tried to borrow five hundred, the cashier at our bank was wearing a pair of three buckle galoshes. They were buckled, too.

Oh, yes, I've got enough left to plant me at the usual depth and with the customary trimmings. But I'm not a dead one yet. How about you?

Jim says that our letters, while courteous, seem to him cold. He knows all about them and about all of them as we sell him occasionally and he takes his time—also considerable of ours.

Since Jim brought this up I have noticed and read with much interest a number of articles in business publications recommending the humorous collection letter.

I can readily see how this type of collection letter might bat a pretty good average for Jim and others similarly situated. His territory is not large and he gets to know his trade pretty well. Our territory, to quote an enthusiastic plumber of my acquaintance at a Board of Trade meeting, extends "from the great Outlantic to the broad Piasific Ocean"—and then some. Transportation facilities have not as yet developed to the point where I can call on all of our customers at least once a year, do the necessary office work and get back each Saturday for my pay envelope.

It was easy enough to stand Jim off with such defensive arguments but when one of our own men—and a branch manager at that—came along with the same line of talk I just naturally began to do some real thinking.

I soon came to the conclusion that the thing to do was to find out to what extent our salesmen and other branch managers shared his views. In order to do this, I sent out a questionnaire to all our representatives. With it I sent a semi-serious letter submitted by our branch manager and his letter to me. I also included several letters taken from a recent magazine article favoring the humorous type of letter. While I stated some of my reasons for using the serious letter I made it clear that I desired the frank opinion of our salesmen and branch managers.



"As I understand it, a collection letter is to collect a past due account, and not to amuse the reader. He usually pays admission for that sort of thing.

The question was put as follows:

"Do you believe we would improve our collections by adopting the semi-serious collection letter or, if not, do you think it would pay us to accept whatever loss might come in the efficiency of our letters as money getters for the benefit to be derived from a sales standpoint? In other words, do you recommend our adopting the semi-serious collection letter in our business?"

48 questionnaires were sent out and returned. 9 voted for the semi-serious letter, 35 voted against it while 4 were neither wholly for nor against it. There were no comments from those voting directly for the semi-serious letter.

Our branch manager who originated the discussion voted for the semi-serious letter—I am quoting his words—"with reservations as below. The

(Continued on Page 30)

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Has Finance Kept Pace with Production?

An Interview with W. C. Durant

WE Americans like to think of ourselves as doing things on a big scale. We pride ourselves upon our Edisons whose ideas crystallize into marvelous inventions; upon our Fords, who create gigantic enterprises out of belief and persistency; upon our Harrimans and Hills from whose visions emerge realities in nation-wide transportation.

The ideas of these geniuses of construction and production are solidified into actuality through the medium of money. Finance and productive genius must be team-mates and each pull its share of the load. Has American Finance kept pace with American Productive ability during the past decade?

This is the question that we asked of William C. Durant, organizer of the Buick Company, the Chevrolet Company, the General Motors Corporation, and of Durant Motors, Incorporated, his latest development. But before giving his answer, just a word or two, to indicate how well-qualified Mr. Durant is to speak of the relation between finance and productive effort.

In 1904 he took hold of the Buick Motor Car Company, then about a year old, and with its affairs almost hopelessly tangled. After he had gotten them straightened out sufficiently to "take a reckoning" the balance sheet revealed total resources of $75,000—certainly not an over generous amount on which to establish the Buick's future. Be that as it may, the facts are that with this meagre start, under Mr. Durant's guidance, the Buick progressed in sales and earnings sufficiently to enable the purchasing, in 1908,—less than four years later, of the Cadillac, Oakland, Oldsmobile and Northway Motors Company, and the establishment, in 1911, of the Chevrolet Motor Company.

Big activities like these call for financing on a scale equivalent to the production involved and of course the logical financial agent is, or ought to be, the banker. But too frequently, manufacturers tell us, the banker is not content with furnishing the finance but insists on taking over the control of the property (which really means its management), despite the fact that he may be totally unfitted to control the development of ideas or to dictate management policies.



W. C. Durant, whose portrait appears above, took hold of the Buick Motor Car Company in 1904 when its resources totalled $75,000. His development of this property was such that four years later he was able to buy the Cadillac, Oakland, Oldsmobile and Northway Motors; to secure the controlling interest in the General Motors Company, and to establish the Chevrolet Motor Company. Chief executive of the General Motors Corporation from 1908 to 1920, he in May, 1921, organized Durant Motors Incorporated, of which he is president.

Mr. Durant has had plenty of experience in securing finances, as any one may imagine from his manifold accomplishments. He has been in a position to see whether our big financial institutions are or are not keeping pace with the leaders in production. He has, during the 17 years since he has been in the automobile business, borrowed and repaid hundreds of millions, mostly from bankers. And here is what he has to say about it:

"It is unnecessary to emphasize the fact that we have been passing through the most serious panic ever experienced in this country. Much of this distress has been due to extortionate interest rates and restricted credits. Money, like any other commodity, should be controlled by the law of supply and demand. The fact that it has been otherwise artifically controlled has led to our present difficulties.

"Business has been crippled for lack of money with which to operate. Money has been withheld from business by the bankers, acting in conjunction with the Federal Reserve Board. The situation has been profitable to the banks because it has been possible for the bankers to demand outrageous prices for the use of money. Because it has been impossible for business men to pay the price demanded for money, they have accepted the only alternative and have closed their plants. The deplorable phase of this situation is that such a condition should exist at a time when practically the entire world's supply of money is in this country."

While Mr. Durant does not suggest the solution in so many words, it is quite certain he feels that he has found the solution, for it is now a matter of common knowledge that in financing his latest undertaking, he has ignored the bankers and has gone directly to the people for his funds.

Durant Motors, Inc., organized at a time when the depression was at its height, in January, 1921, has bought factories, built factories and equipped them, and has gone into the production of automobiles on a large scale through funds supplied by upwards of 12,000 stockholders, and not one penny of the stock was distributed through underwriting or through any of the other usual brokerage channels.

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The Consumer-Partner in Electric Utilities

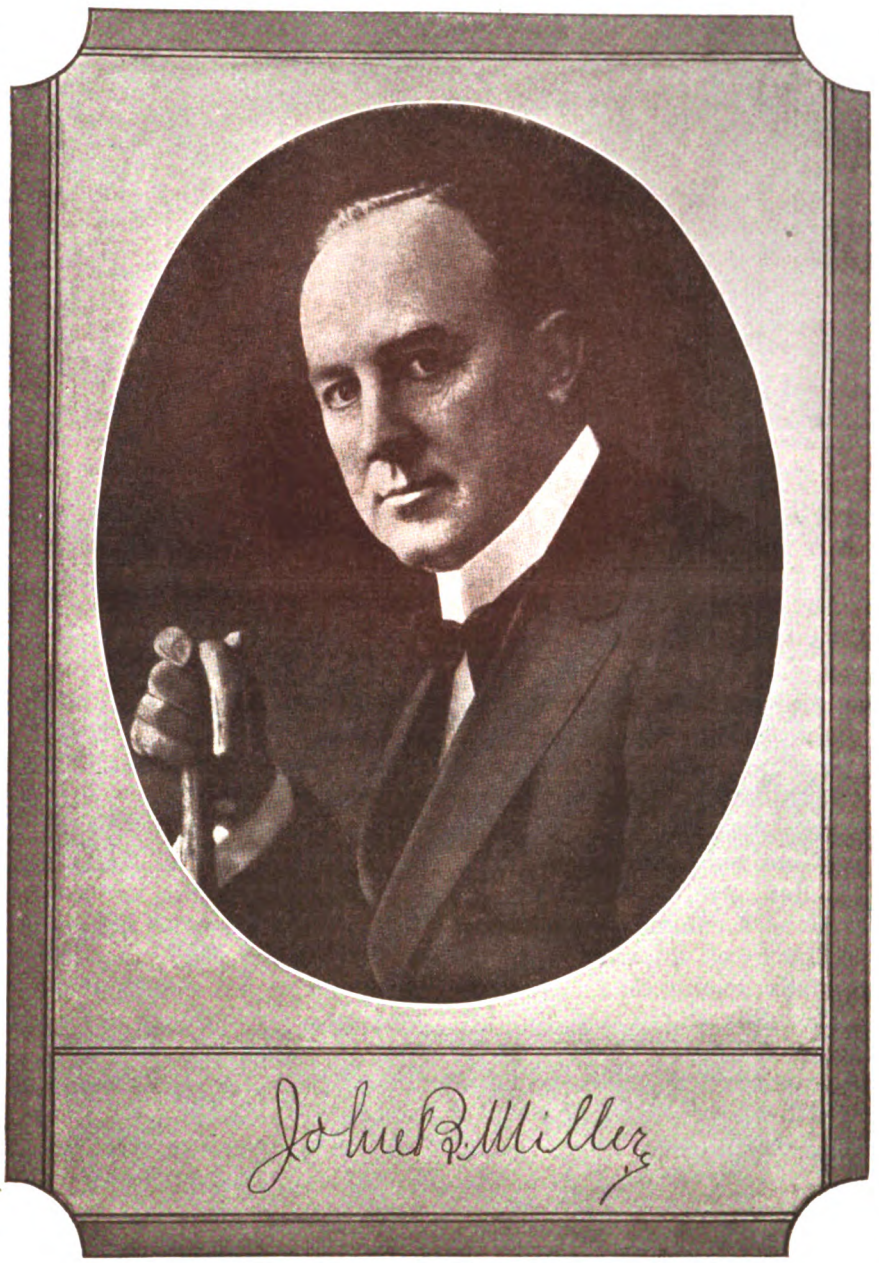
By John B. Miller

ONE of the most gratifying features in the development of hydro-electric power—the industry with which I have been identified for the last twenty-five years—is the present tremendous move toward consumer-partnership; in other words, the actual participation in ownership of a public utility by those whom it is seeking to serve.

In California, at the present time, there are over half a million consumers directly interested in the utilities which provide for their electrical necessities, and the number is growing at the rate of thousands every month.

To me, this is most encouraging for the still more rapid growth, development, and usefulness of this great industry. We speak of the electrical industry as a giant, the prime mover of all activities, but as yet it is only in its infancy. It was but 38 years ago that the first commercial generating plant was established in this country. For many years to come, the management of public utilities must face the necessity of discarding the obsolete to give place to the ever-increasing improvements and efficiencies brought about by modern inventions. Under private- or consumer-ownership, this scrapping of obsolete or inefficient machinery is demanded in the interests of progress and economy. Under political administration, however, such procedure would be impossible without endless red-tape and confusion.

In 1893 this company constructed a hydro-electric plant with about 1000 HP capacity, transmitting electric energy at 10,000 volts for a distance of about 14 miles, on what is technically known as Three-Phase, and the undertaking was considered so radical that we had difficulty in persuading electric manufacturers to build the machinery. Today we are transmitting electricity approximately 370 miles at 220,000 volts, and at the present time



Mr. John B. Miller, President of Southern California Edison Company, Los Angeles, California, has for the past twenty-five years been devoting his best thought and effort to the rapid consummation of his vision of hydro-electric power applied to the needs of Southern California—the irrigation of semi-arid lands, manufacturing, industry, convenience in the home—with the resultant large population, prosperity and public wealth. The company of which Mr. Miller is the head, has expressed its willingness to undertake the great project of developing the electric power resources of the Colorado River, and controlling its flow for the elimination of flood damage, and providing for the irrigation of millions of arid acres.

I am associated with an experimental laboratory in Pasadena, California, where some of the men most advanced in electrical science are working along lines which indicate that they can accomplish transmission at 1,000,000 volts.

With the ownership and management of their electric utilities within the control of those whom the utilities serve, the interests of the utility and consumer are identical, and there is harmony and co-operation. Consumer ownership is analogous to the principle of home-ownership. It is a recognized fact that a community of home-owners, is more progressive, more harmonious, more substantial, than any other.

Hand in hand with consumer-partnership goes employee-partnership. In our own company, 90% of our 3500 permanent employees are stockholders, and of the more or less temporary employees who are engaged in construction work, a very considerable number have also purchased stock, making in all, 3500 employee-partners, owning $6,000,000 worth of stock. As a natural result, there is a pride, a conscientiousness, a loyalty that insures harmony, co-operation, and highest efficiency throughout the entire organization. The employees are enthusiastic over their company, because they are not merely employees, but partners.

Contrast this condition of a community of harmonious consumer-owners, with that of municipal or public ownership, in which it might be necessary to have several elections, an initiative, and a referendum to decide upon a question of comparatively minor importance in connection with a municipally owned utility.

Because of the soundness of the principle of consumer-partnership, and the tremendous success it has proved to be, I am convinced that private agencies regulated by the Federal and State Government, are amply justified in expressing their desire to undertake the great project of harnessing the Colorado, preventing flood destruction, developing the tremendous power resources, and providing for irrigation of millions of acres of now waste and barren land.

I am frequently asked the question, "Is not this undertaking too great for private enterprise?" My answer is, "No, the equity money for the project will be very largely held by those who will consume the electrical product of the Colorado River Development, and this will mean that the

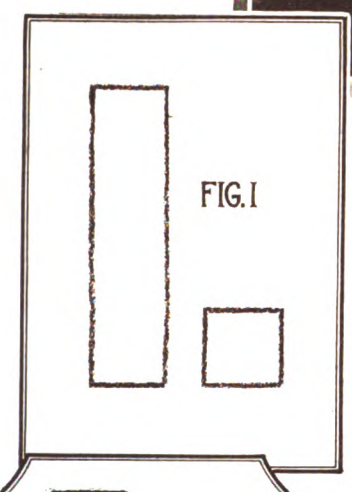
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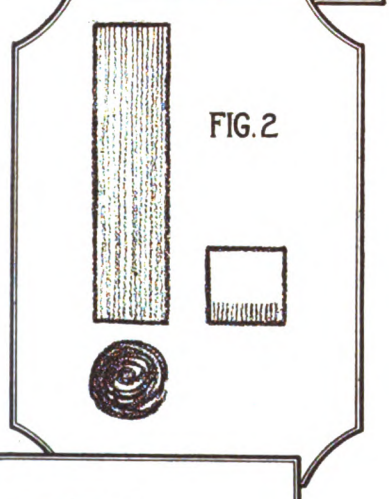
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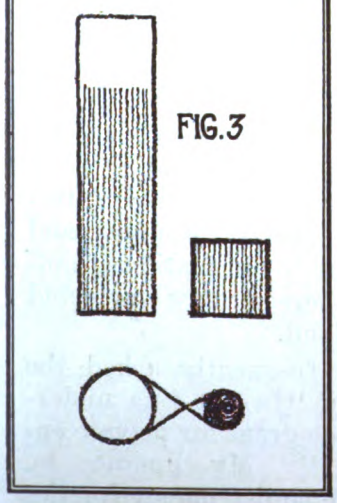
Illustrating the Sales Talk

By Myles S. Wilder









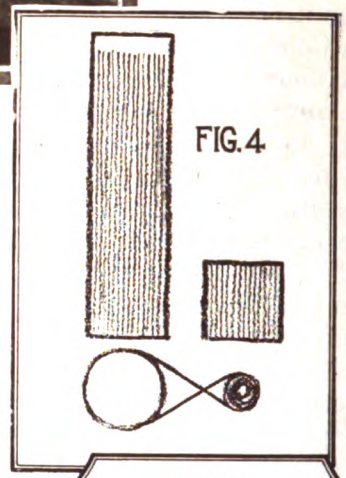
WHEN you pick up a periodical, what do you look at first?—the pictures. You start with the illustrated stories, the cartoons, the technical articles which are amplified with graphs and charts. Your snap judgment is that a page of solid type is "dry stuff," even though it may actually be the most fascinating reading matter. This popular preference for pictures is a common psychological fact well known to editors and advertising men; hence the elaborately illustrated Sunday supplements of newspapers, the pictorial weeklies, and the wealth of illustrations even in business papers.

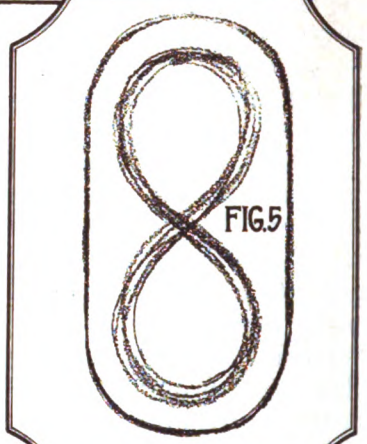
Mr. A. R. Brown, Advertising Manager, National Sweeper Division, The Torrington Co., Torrington, Conn., has made a special study of the appeal of pictorial representation.

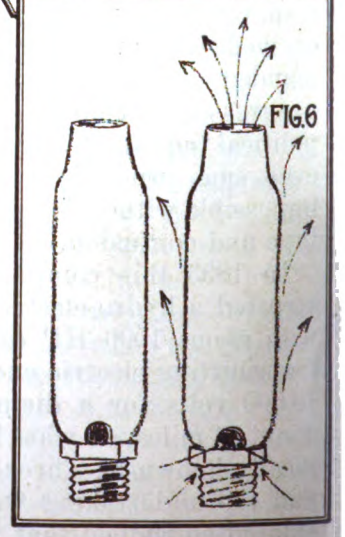
"Because it is my business to seek new ideas in salesmanship," said he, "I have pondered this matter of the popular picture hunger pretty deeply. 'Why,' I said to myself, 'why can't a salesman take advantage of the public's appetite for pictures? Why not have illustrated sales talks?'

"The first efforts in this direction were in the shape of scrap books. Salesmen were provided with a wealth of photographs, not only the cut-and-dry retouched advertising pictures with stilted models and overdrawn trade-marks, but they were also given many 'human interest' pictures of real people in sure-enough home surroundings doing things which flesh-and-blood

(*Continued on Page 30*)









The illustrated talk enables the salesman to control both the eye and the ear of his customer—and insures a definite and lasting impression.

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What Do You Know About Anthracite?

BY W. THOMSON LEES

WHERE we used to have but one topic of conversation of universal interest—the weather—we now have two more: Prohibition and Coal. A good many people who had a hazy notion that the Constitution was in some way connected with bodily well-being, were awakened by the Eighteenth Amendment to a closer study of that interesting document; and they are still talking about their recently acquired knowledge. A number of people, too, whose knowledge of coal was confined to its retail price, are being impelled by that very thing to find out why and wherefore.

Probably the only thing that keeps the last-named subject from outstripping prohibition as a live topic, is its seasonal character. We can't seem to work up a really vital grouch over the scarcity or the high price of coal, during the dog days of early August. If we *could* maintain our interest the year round, we might do something about it. Especially, if we were fully acquainted with the facts.



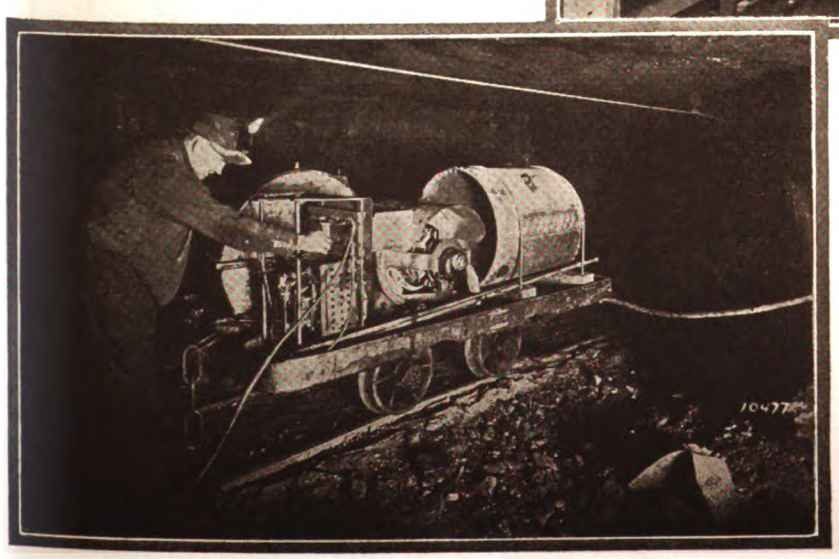
Wherever possible, concrete arches are used in anthracite mines. Nevertheless, anthracite mines use approximately one-half billion board feet of lumber every year.

Why is there a shortage of anthracite coal—who is to blame? Is it a labor problem, a profiteering problem?

Irrespective of any contributory factors in the way of labor disputes, there is a shortage of anthracite coal because Dame Nature didn't make enough of it. All coal, both soft and hard, is the product of geological changes that occurred ages ago. Anthracite coal (hard coal) is merely that portion of the coal which went through a more strenuous course of treatment in those pre-historic days; being subjected to incalculable pressure during the upheavals which produced mountain ranges and altered the whole surface of our continent. Only a very small portion of all the coal formed was thus converted from bituminous into anthracite. So, at the very source, there is an actual shortage of the latter. Partly through ignorance, partly through our national vice of extravagance, we have depleted the store. Although the available supply of bituminous is well-nigh in-



Undercutting a vein. Anthracite mining ranks second to copper-mining as a hazardous occupation.



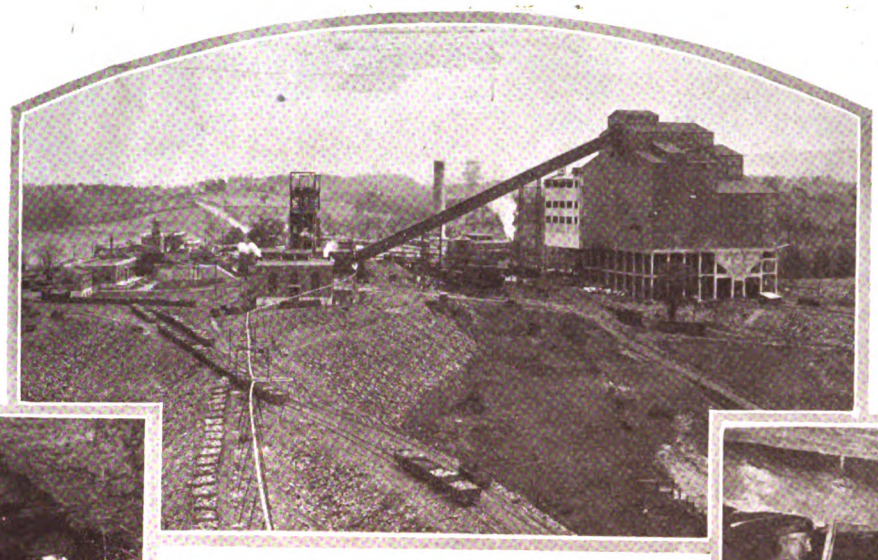
Air compressor (below) for supplying air to a drill—anthracite mine near Scranton, Pa.



(© E. Galloway)

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Below—Rescuers in a mine, using canary bird for the detection of poisonous gases. The bird being more susceptible, its asphyxiation warns the men that the atmosphere is dangerous.

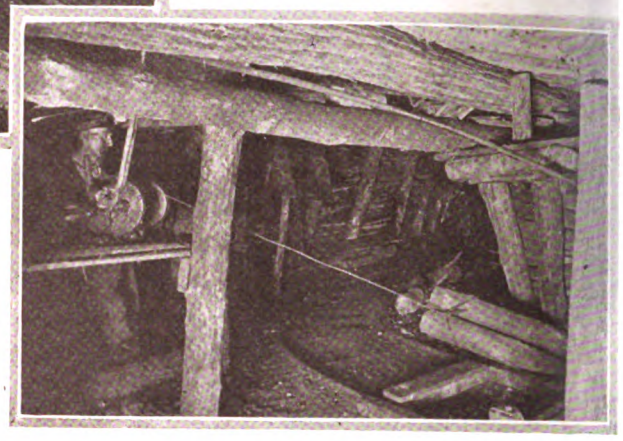


Below—Hauling shoring timbers up an incline by means of air-operated hoist. The use of compressed air for power eliminates the risk of possible sparks from electric motors.



(C) E. Galloway)

To prepare anthracite for market, it must be separated from the slate and rock with which it comes from the mine, washed, and crushed to size. All of which requires a sizeable equipment. Above, is the Loomis Breaker of the Glen Alden Co.



exhaustible; with regard to the cleaner, more convenient anthracite, the time is not very far off when we shall be told "That's all there is—there isn't any more."

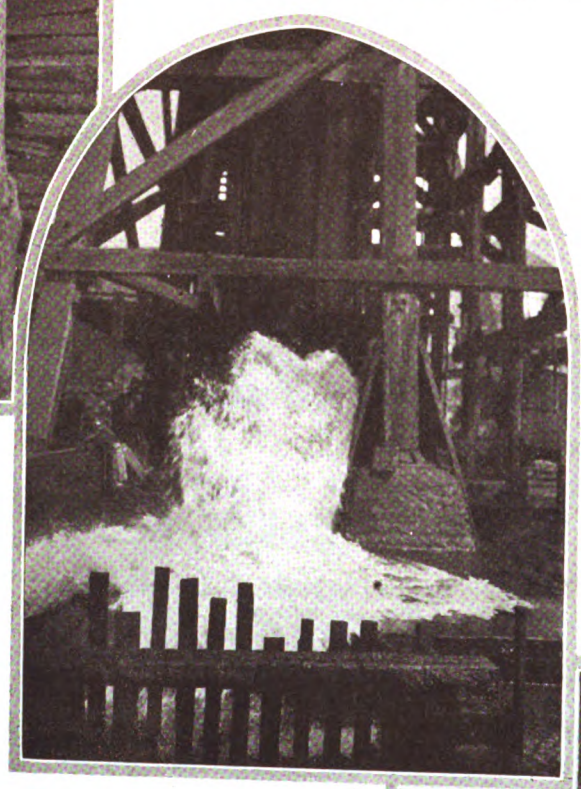
The same geological upheavals that turned soft coal into anthracite, in the process of making mountains and valleys, twisted and compressed the coal; so that anthracite mining is a totally different proposition from bituminous mining. The latter lies in what might be termed submerged fields, often quite near the surface of the ground. Anthracite, on the other hand, occurs in thin veins that run in different directions—frequently through hard rock; and getting it out, is a matter of following these veins, drilling, blasting, and shoring up the resulting tunnels.

Once out of the earth, there



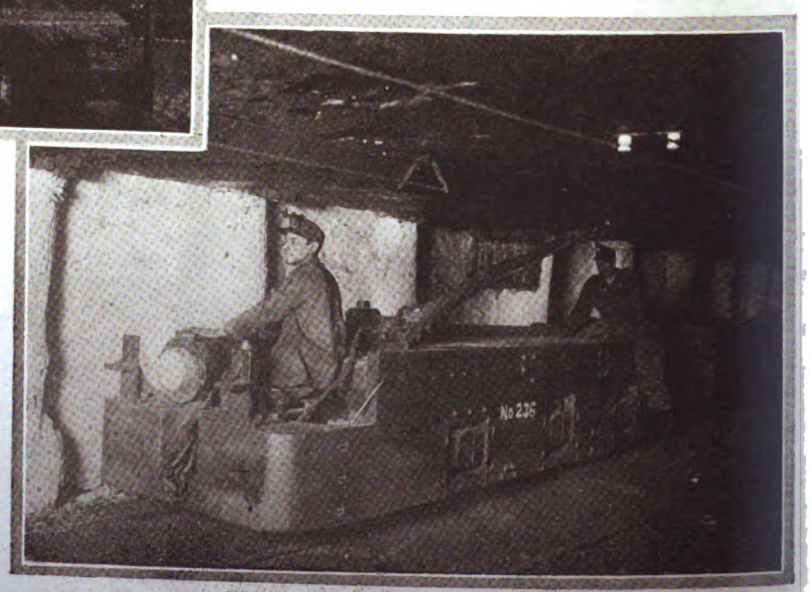
The man at the left is pulling down loose coal, after a blast, while the one at the right is undercutting the vein with an air drill.

Below—For every ton of coal marketed, an average of eighteen tons of water must be pumped out of the mines. In following the coal veins, it is not uncommon to have a blast open up a subterranean stream, which floods the workings and often causes loss of life.



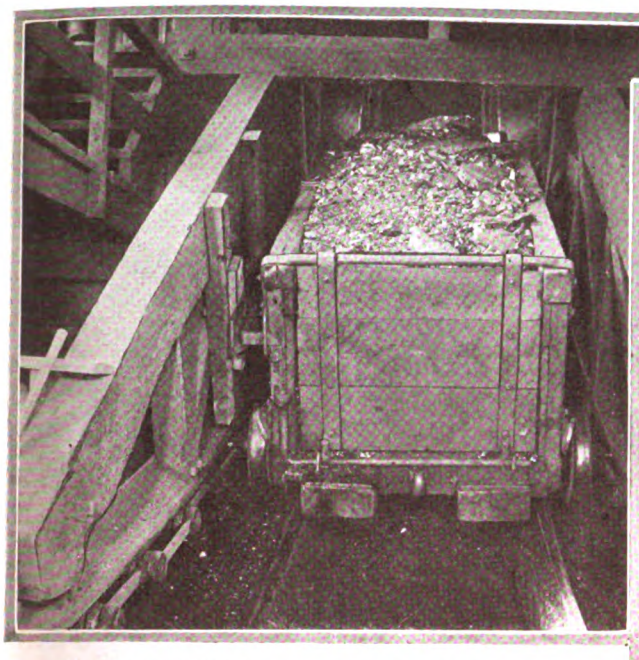
These double houses (each half renting for $10.00 a month) were built by the Lehigh & Wilkes-Barre Coal Co., at Nanticoke. Pa.



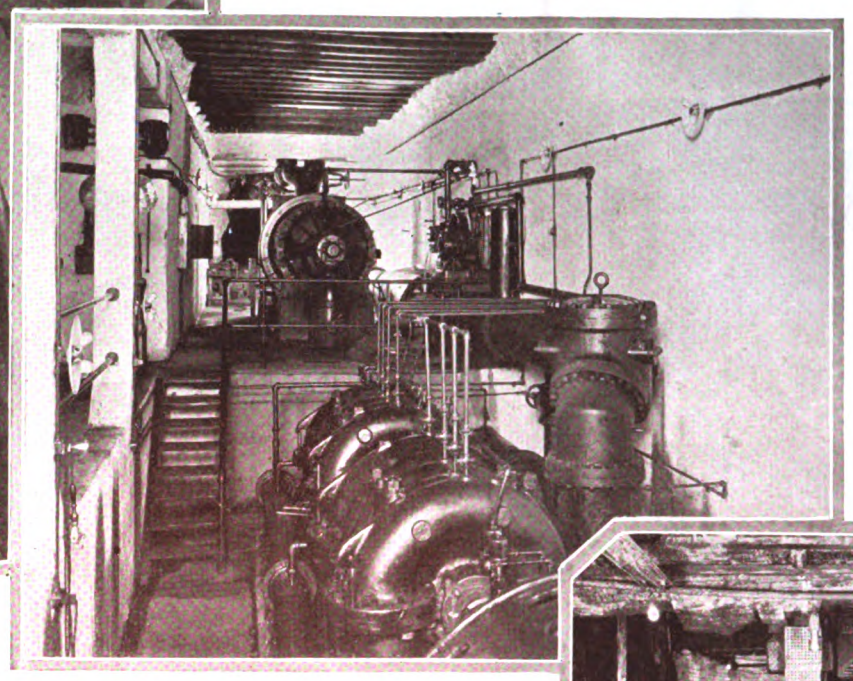


One of the 15-ton electric locomotives that have to a great extent replaced the mine mule. The latter, however, still is needed in some of the workings.

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Mine car full of coal, rocks and dirt, ready to be dumped into the breaker. The latter cleans and separates the coal from foreign matter, and crushes it to size.



At the left—an idea of the magnitude of the water problem, in anthracite mining, may be gained from these big centrifugal pumps, located 300 feet below the surface, at one of the Scranton mines.

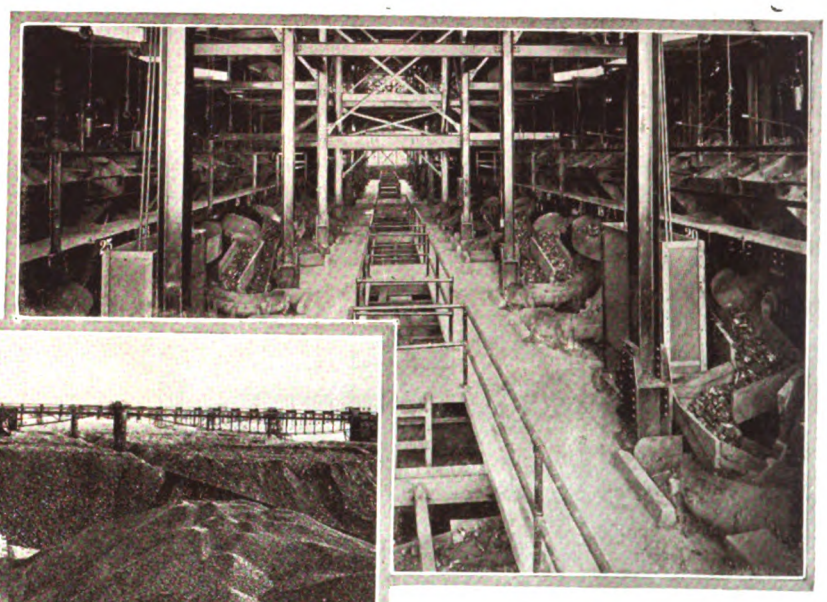


At the right—coming to the surface in the "cage," after a day's work below.

is a further big difference between bituminous and hard coal. The former requires hardly any preparation, being in the form of soft, easily broken chunks. Anthracite, on the other hand, because of the slate and rock that is inevitably mixed with it during mining, has to be cleaned; and, as it will not crumble and will not burn unless broken up, it has to be put through crushers which break it into sizes fit for its various uses—from egg and stove sizes for domestic use, to the very small "steam coal" used by public service corporations. So, before it gets into the hands of the railroads for shipment, anthracite has already cost more than bituminous to mine, and has had the added cost of preparation for use. In the very nature of things, those two items of extra cost can never be eliminated.

Several things, however, *can*

At the right—a battery of Trench jigs in the Mawine Breaker, Hudson Coal Co., where the various sizes of coal are being prepared for market.



Below—Nearly a million tons of coal, on the Pittsburgh Coal Company's dock at Superior, Wis. Said to be the largest and best equipped coal dock in the world.

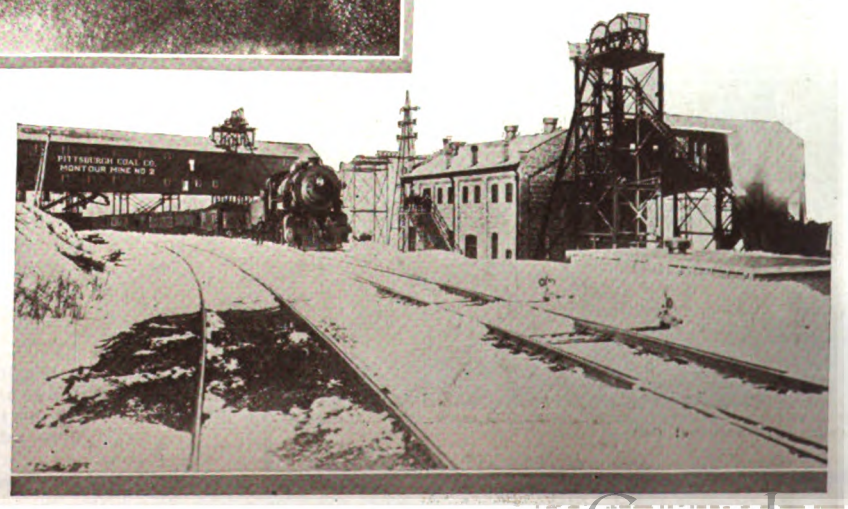


Below—Typical up-to-date Pennsylvania mine and overhead loader, with a train of cars being loaded one by one.

(© E. Galloway)



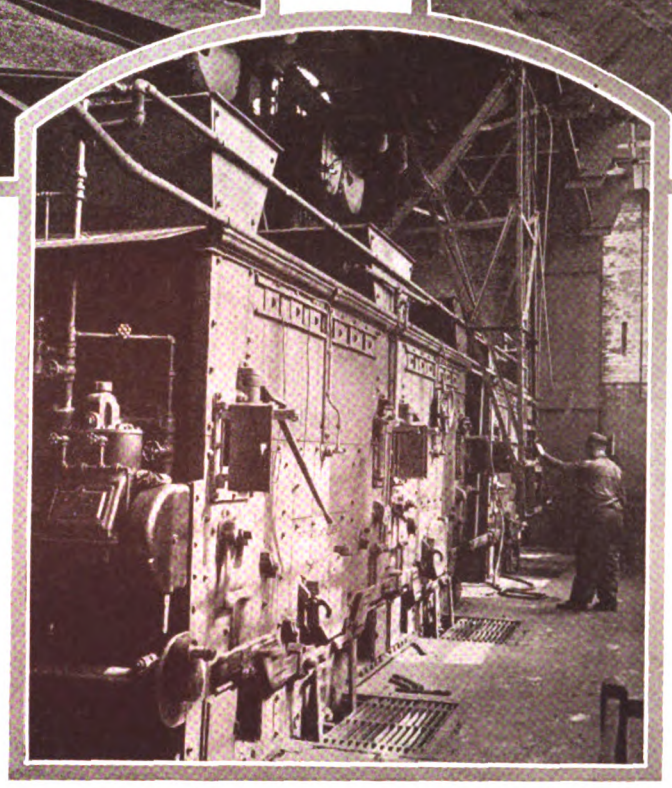
Above—Anthracite coal awaiting shipment from Toledo to northwestern Great Lakes ports.



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Above—Several acres of coal cars in the Susquehanna R. R. yard at Undercliff, N. J. Coal on its way to New York City.



Modern stokers and efficient management enable the industrial coal consumer to avoid wasting fuel. If such apparatus could be used in a house heating plant, there would be no "coal problem" as applied to anthracite.

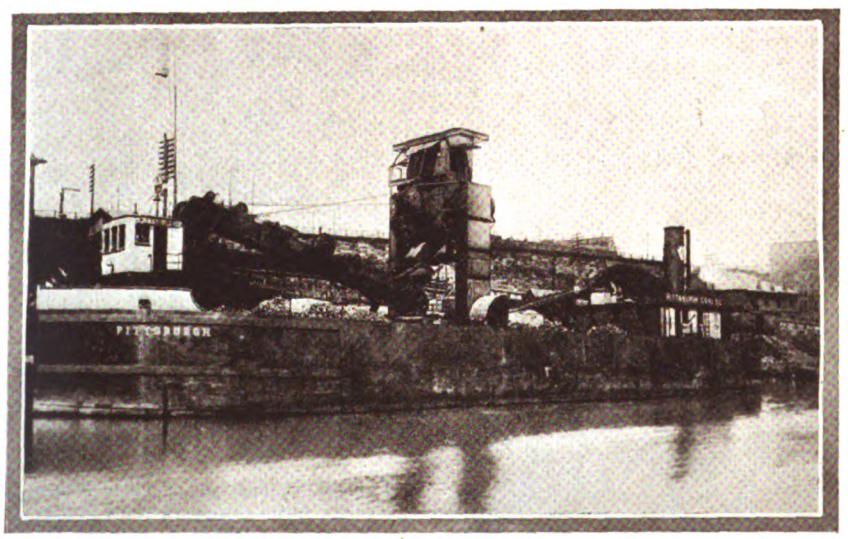


Above—240,000 tons of coal in the storage yard of the New York Edison Co., at Edgewater, N. J.

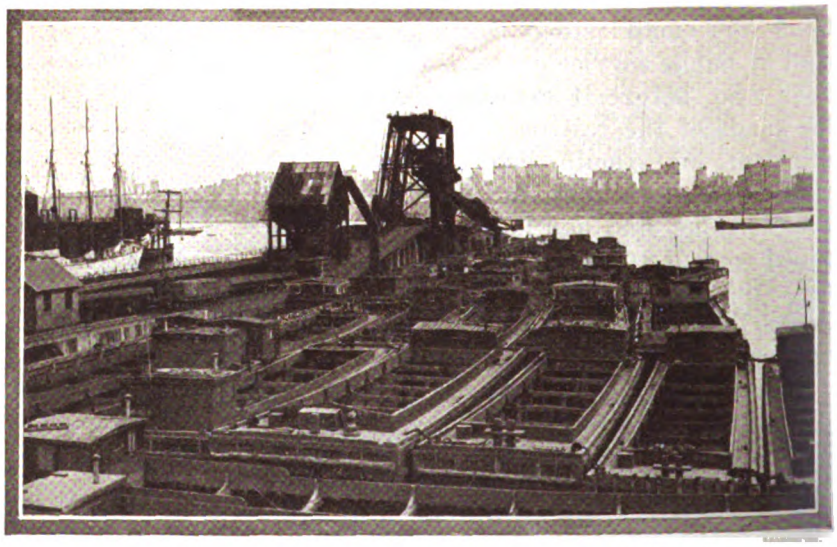
be done to bring down the cost of our coal. One of the items that adds to this cost, is the fact that anthracite is a seasonal commodity. Fully two-thirds of the anthracite mined goes to the domestic consumer; and the domestic consumer wants coal only during the cold months of the year. In consequence, it is necessary to provide costly storage space at the mines, where the coal accumulates to await heavy buying in the autumn. If we could establish the habit of placing our coal orders early for delivery during a six-month period, this extra cost could be done away with. The public service corporations and the few other large users of anthracite not only distribute their demand over the year, but many of them buy run-of-mine coal and crush it to size at their own plants—a saving outside the possibilities for domestic consumers.

Aside from a change in *buying* habits, the domestic consumer needs to change his *burning* habits. At a conservative estimate, one shovel of household coal in every seven is needlessly wasted. Most of us keep our homes at a temperature higher than is necessary either for comfort or for health. Although 68° Fahren-

(Continued on Page 36)



Above—The largest and best-equipped vessel of its kind on the Great Lakes, which handles coal from Cleveland, Ohio.



A fleet of barges at the Susquehanna coal pier at Undercliff, N. J. These barges take the coal across the Hudson.



This, with the headpiece at the beginning of this article, is a panorama of the enormous storage space necessary at the mines, owing to seasonal demand for anthracite.

(Courtesy Hudson Coal Co.)

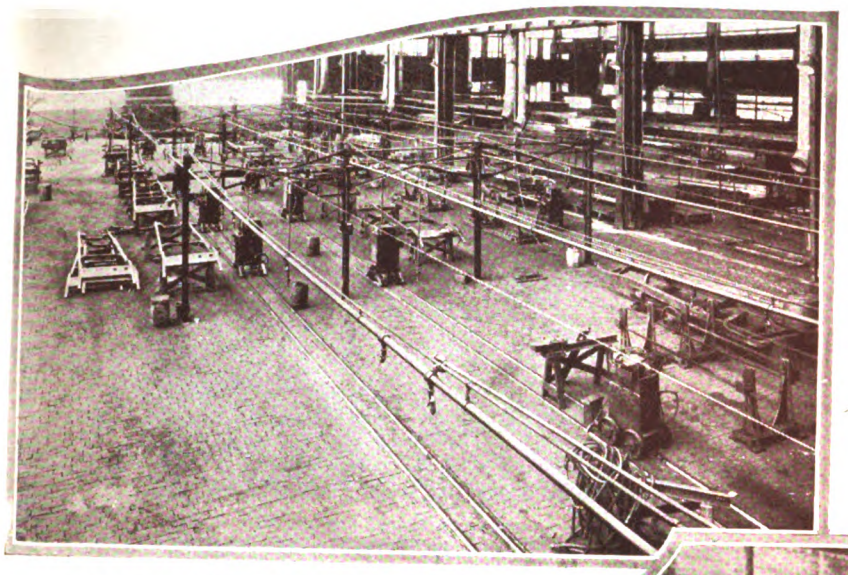
(Other Photos on this page, © E. Galloway)

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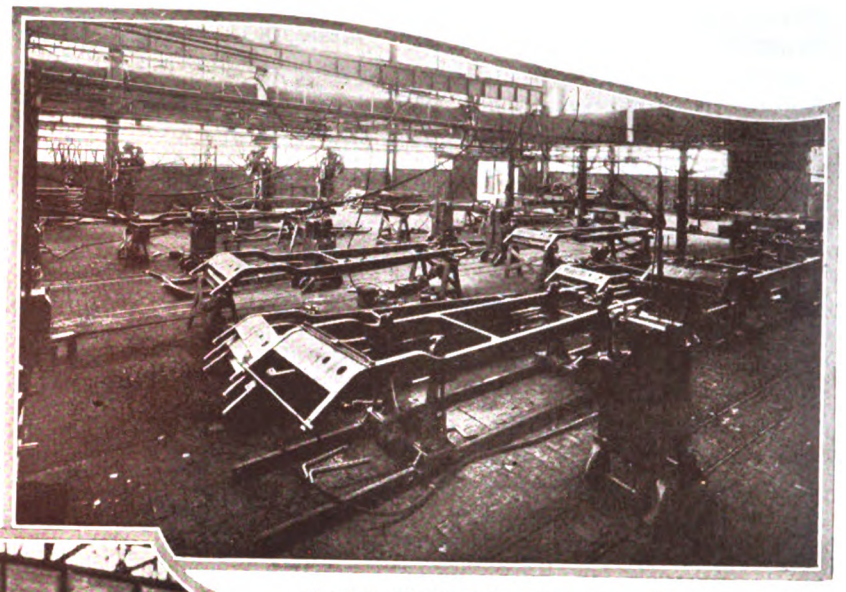
Modern Methods in Automobile Frame Assembly

By W. E. Irish

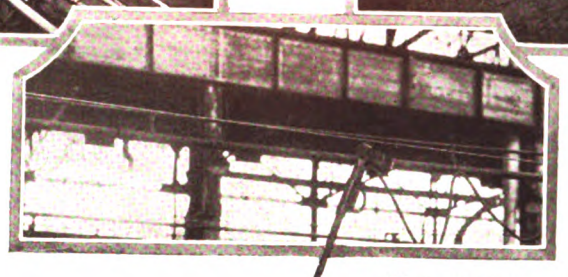
(Plant Engineer, The Hydraulic Pressed Steel Company, Cleveland, Ohio.)



A general view of the section, from overhead, with two of the three units equipped for production. Loose parts come in on trucks on the right hand side, and completed frames are loaded to the conveyor track on the left.



A view of one unit, taken from the starting side, and facing the final inspection stand, shown in the upper center of illustration. In the foreground is the electric rivet-heater that serves the two assembly stands that are next in line. This is followed by a floor space of sufficient width to pile frames and to allow working room for the men around the stands.





The electric rivet-heater, showing how the trolley can be readily removed. After a year of service, no trouble of any kind has been experienced.

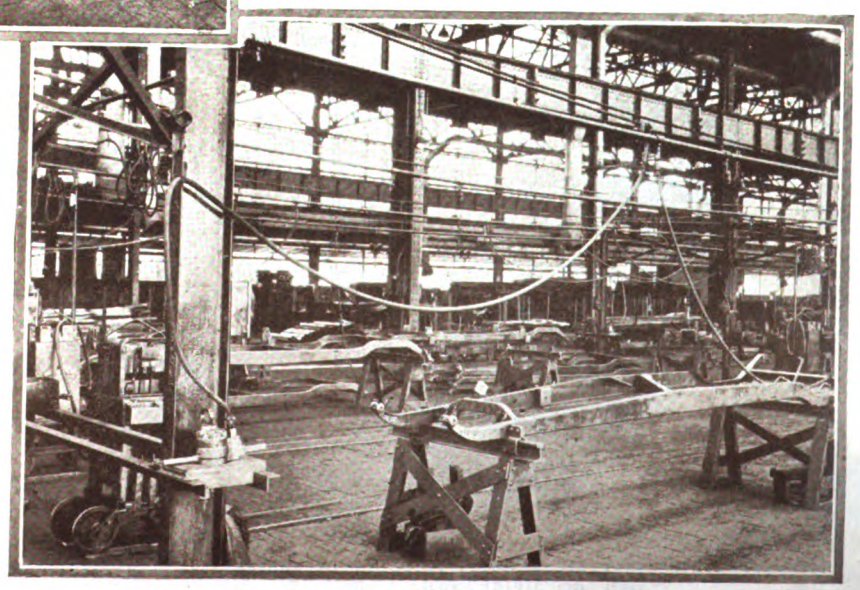
THERE are probably comparatively few automobile owners aside from those whose business brings them in contact with their manufacture, who stop to think that there is such a thing as a frame in their machine, the manufacture of which presents many complicated problems, or that there are many companies whose product is almost entirely made up of these frames, to supply the demand of the Automobile Industry.

The Hydraulic Pressed Steel Company of Cleveland is only one of many such concerns whose chief business lies in the fabrication and assembly of automobile frames and parts, and although it may seem to be starting the description of a pressed steel frame somewhat late in the sequence of the processes involved, by beginning at the point where the parts are ready for assembly, there are features in the methods of assembling that are

(*Continued on Page 54*)



A view of the same unit as shown in the illustration in the upper right corner of the page, taken from the finishing side. Shows the unit, with gangs in place for work.



A view of the reamer, with its electric cable protected by rubber hose. The construction adequately protects from wear, tension and twisting.

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Four Views of

How Loyalty is Inspired by Ideals and Leadership

BY S. R. RECTANUS

LOYALTY is not developed, it is inspired. Personality is the dominating force which holds men and women together to work for a common purpose. You can know and understand and believe in a man. You can have confidence in a leader. Confidence and understanding are the foundations of progress, and no progress can be secured without leadership which is understood and trusted.

Intelligence is necessary to the growth of loyalty. Success has come in the largest measure to groups of intelligent people who can think and have the ability to understand; who can see beyond present difficulties and loyally hold together for future accomplishment.

Loyalty, like respect, is mutual, and the leader who does not believe in his men and trust them and work for them can only expect a like response. No manager can expect to hold his place unless he steers a true course. It is quite easy to convince ourselves of the wisdom of the things "we prefer to believe" and constant testing and accurate observation are essential if we do not mislead ourselves. The manager who does not find the truth and prove it is sure to lose the loyalty of his organization just as much as the leader who does not resist attacks upon his team.

During the last ten months the wages of iron and steel workmen have been reduced 45 per cent as a necessary part of the liquidation of the industry. Profits have disappeared at the same time. During these ten months there have been drastic reductions in the selling prices of iron and steel products. Because prices are still higher than pre-war, there have been many consumers and some statisticians and editors who have insisted that steel prices are still too high.

The *esprit de corps*, the loyalty of iron and steel workers will be lost if these incorrect statements are not disproved. But the loyalty of the men will be lost just as surely if the incorrect statements are denied although correct.

(*Continued on Page 53*)



S. R. Rectanus, Director of Employment, The American Rolling Mill Company, Middletown, Ohio, started to work in that organization as a laborer, immediately after his graduation from Purdue University in 1909. After seven years' experience as foreman and department superintendent, he was appointed to his present position. He is a former president of the National Association of Employment Managers, now called the Industrial Relations Association of America.

An Industrial Disarmament Conference

Getting Employer and Employee Together on Common Ground

BY G. W. HANLEY

The details of the plan here outlined are practically a duplicate of the method by which the Armco Association has been made one of the most successful industrial organizations in the country. Mr. Hanley has been interested in community organizations for the last ten years, and his experiences as Managing director of the great Armco organization for the last two years makes this plan as outlined in the chart intensely practical. Mr. Hanley's favorite expression is, "When everyone says it can't be done some darn fool comes along and does it." He believes there are no industrial problems that cannot be solved if the correct principle is applied.

AS the leaders of the world are called together to limit the activities of war spirit, and to conserve each nation's financial and moral resources for a more productive and constructive program of activities, it would seem only natural that the industries of our own nation could well consider a program of industrial relations, that would conserve and make productive the great waste of human effort, resulting from misunderstandings, suspicion and distrust that seems to have grown up between employer and employee.

If it is essential for the successful operation of any industry, that a proper understanding should constantly exist between employer and employee, it must then be necessary that some medium be provided whereby they can have free communication so that each will know each other's problems.

In combining the employer and employee group in an industrial organization, such as is charted in this article, each will become better acquainted through personal contact and general association. This will in a great many cases, present a new viewpoint of the individuals in each group, and through their combined efforts to promote the activities of a leisure time organization, a better feeling will be created; a better understanding of each other's problems; and a bond of confidence will be established that will be carried into the several plants or organizations from which the members of this organization come.

There never could be world disarmament even in a limited

(*Continued on Page 48*)



Geo. W. Hanley, manager of the Armco Association at Middletown, Ohio. The Armco Association is an organization of over three thousand members who are men and women in the American Rolling Mill Co., from the president to the most humble position in the plant.

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Live Industrial Topics



T. P. Webster, Vice President, N. A. P. A., and Purchasing Agent of the Dominion Textile Co., Montreal, Canada

A Nugget of Wisdom in a Nutshell

BY T. P. WEBSTER

WE asked T. P. Webster, vice-president of the National Association of Purchasing Agents, and purchasing agent of the Dominion Textile Company, of Montreal, Can., to state in one paragraph what he considered to be the most usable, practical pointer for a purchasing agent. And here it is:

"Never betray a business confidence. Never divulge a competitor's price. If he has confidence in the integrity of the buyer and that his price will not be divulged, at least one of those competing will be sufficiently anxious for the business, to quote a low price. The reputation for this policy will save many hours of dickering and worry."

Mr. Webster, who has so concisely expressed what should be a guiding primary principle for all purchasing agents, joined the purchasing staff of the Dominion Cotton Mills Company, of Montreal, in 1898, and in 1901, was appointed purchasing agent. Later on when several leading textile concerns in Canada merged into the Dominion Textile Company he was appointed purchasing agent of the company.

Mr. Webster sets a good example to other busy business men in that in spite of his activities he has found time to be alderman of the town of St. Lambert, and mayor for three successive terms. Under his administration St. Lambert developed from a small country village into one of the best-paved, best-administered towns in East Canada. He is also vice president of the Canadian Textile Institute and chairman of its educational committee in Eastern Canada.

Public Opinion and the Price of Coal

BY RUD K. BOGGS

NOT so long ago the railroads' attitude of this country was supposed to be, "The Public be Damned."

Today we have the railroads through every possible form appealing to public opinion.

The recent results in the rail strike situation were attributed by the leaders to public opinion.

The entry of California as a deciding factor in presidential elections has brought the public opinion of the farmer and the West to the front, in Governmental Administration.

Many reasons were given for the slump in business last fall, but all of them in some way were based on public opinion.

Now most of us are asking each other and ourselves, "When will it pick up permanently?"

In considering a resumption of industry in this country, we cannot overlook the fuel situation and the price of fuel as a basic commodity to all industries. This price to the ultimate consumer is made up of many angles, the operator, the miner and transportation. So far, public opinion has it that the operator has been the only one who has lost money or stood any reduction in price on a per ton basis.

The miners still get the same for mining the coal and the railroads the same for transporting it, the operators being reported as losing money. What will change the situation and be the first step towards enabling business to resume, will be eventually decided by public opinion; and the questions we are asking ourselves today, we will answer tomorrow as a unit. Either the public will think that the price is right and conditions proper in the fuel industry for a resumption of business, or else they will think it is not right and conditions will continue the same until they do think so. And so the talked of resumption of business, resumption of fuel industry, the lowering of freight rates, the question of miners' wages, and strikes, must all eventually be decided in some measure backed by public opinion.

It is of utmost importance to all those interested in any angle of the situation, to only expect to present their case before this bar of public opinion at the proper time, on a fair, equal and just basis, and only as such matters are presented, will the public decide.



Rud. K. Boggs, Chairman of the Fuel Committee, N. A. P. A.

The fuel situation is in the hands of the consumer. He has himself to blame for whatever the present or future situation may eventually be. To some extent, he is by necessity,

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What's The Use of Catering?

The Value of Employee Good-Will in Time of Depression

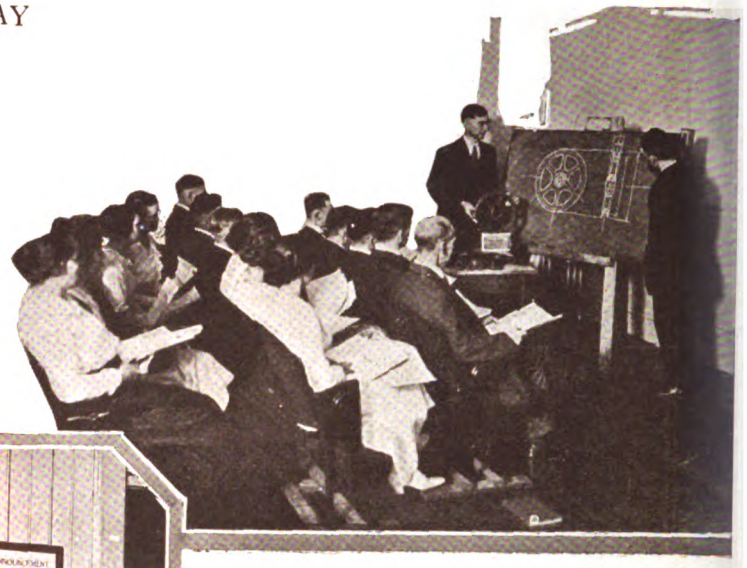
By George W. Gray



In the S. F. Bowser & Co. plant at Fort Wayne, groups have been formed for the study of factory organization and management. The classes comprise foremen, assistant foremen and department heads.



The company's advertising, posted on bulletin boards, enlarges the employees' vision of the worthwhileness of their work and creates a feeling of pride in the organization.



A class of the night technical school of the Shepard Electric Crane & Hoist Co. in session. It has proved easy to infuse a spirit of enthusiasm and to build loyalty and good-will even in the technical classes.

A committee of executives in a certain American manufacturing company sat down one evening last winter to wield the ax of retrenchment.

Their organization is a large one. It includes plants and offices in several cities. During the war it expanded at a tremendous rate. Now, with the ebb of demand and the descent of prices, with the consequent decrease in profit, a reduction of the force seemed necessary. In fact, from preliminary surveys it was apparent that in almost every plant and office there were some soft jobs that could easily be dispensed with. A great deal of needless paper work was being done. The committee figured that they could cut the clerical force ten per cent, thereby saving $2,000,000 a year in salaries, without impairing the efficiency of the organization.

But, could they? How about the supervisors and other under executives whose departments were to be decreased? What would they say? What would they do? The efficiency of the organization depended on keeping intact the trained supervisory force. During the war the company had built up this element at considerable expense, and it naturally hesitated at any measure now that would give affront to the goodwill or deaden the morale of the personnel it wished to retain. And yet, there was the perfectly possible ten per cent cut that must be made.

"Why can't we fall back on

(Continued on Page 39)

Below—A foremen's study-group in session at the Corning Glass Works.



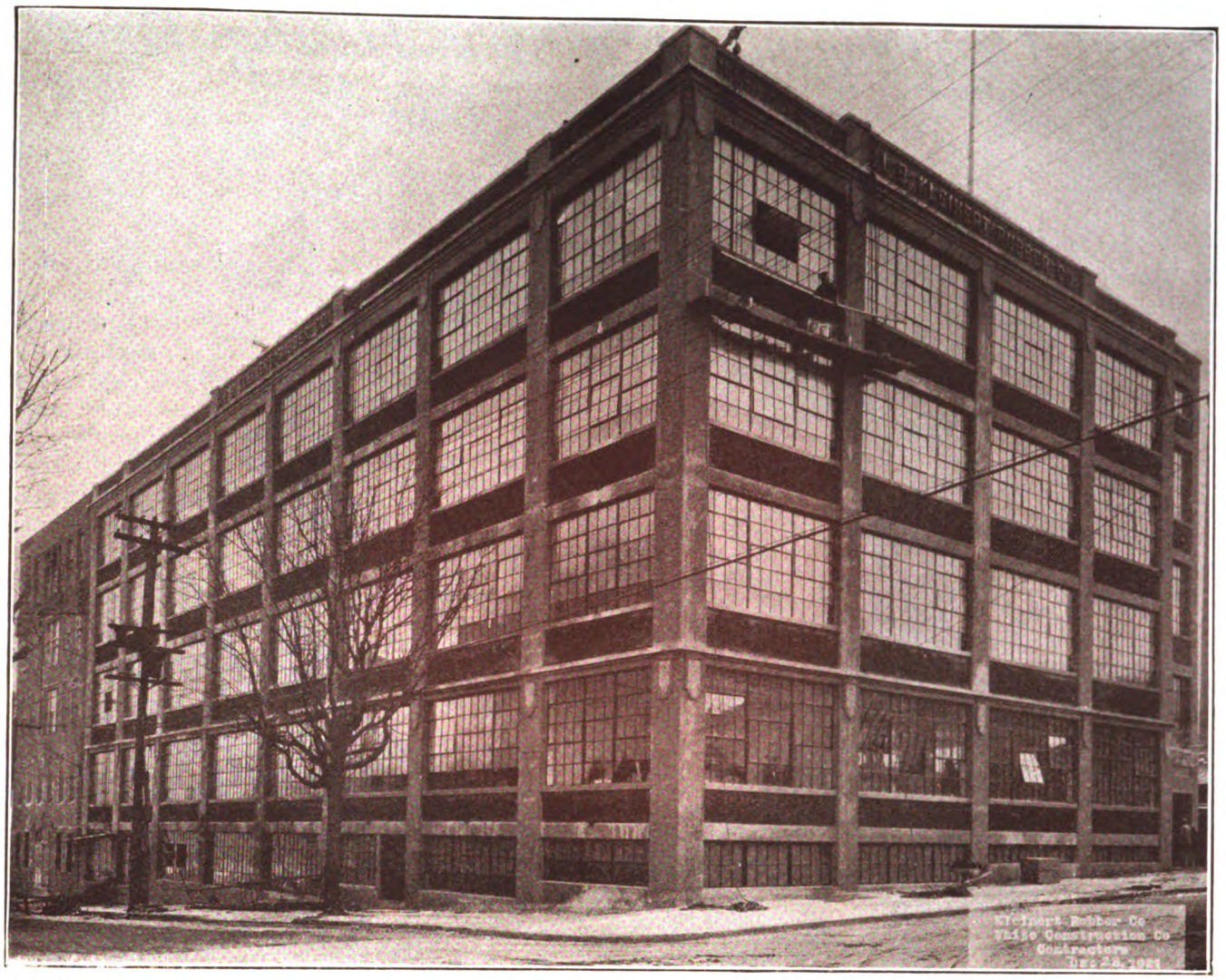


The Production Club of the Shepard Electric Crane & Hoist Co.; made up of foremen and other leaders who have completed the foremen's training course.



A group of assistant foremen and other keymen who are in training for larger responsibilities at the Carolina Cotton and Woolen Mills Co., Spray, N. C.

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Kleinert's New Four Story and Basement Factory

College Pt., N. Y. — *Russell G. Cory, Engineer*

And I. B. Kleinert Rubber Co. said: "Let WHITE build it of CONCRETE"

TO enable them to handle enormously increased business and to give prompt deliveries of their merchandise, Kleinert's open 1922 in this splendid, new, *White*-constructed factory.

Are you equally well prepared to meet the increasing needs of your trade? Our quarter century of experience in industrial construction satisfying the needs of many prominent corporations qualifies us to render you the highest character of service wherever you may be located.

Send for actual photographs of recent *White---constructed* buildings.

CONCRETE WHITE CONSTRUCTION CO. INC. NEW YORK

WHITE CONSTRUCTION CO., INC.

95 MADISON AVE., NEW YORK, N.Y.

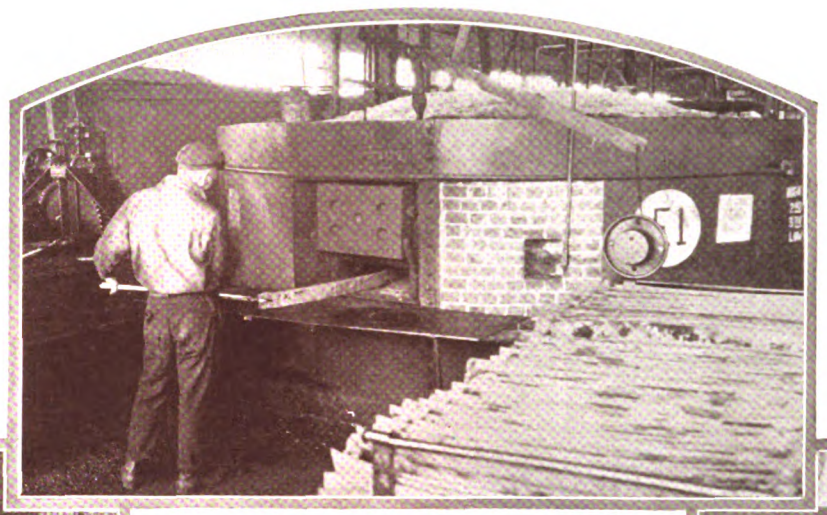
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The Electric Furnace of Today

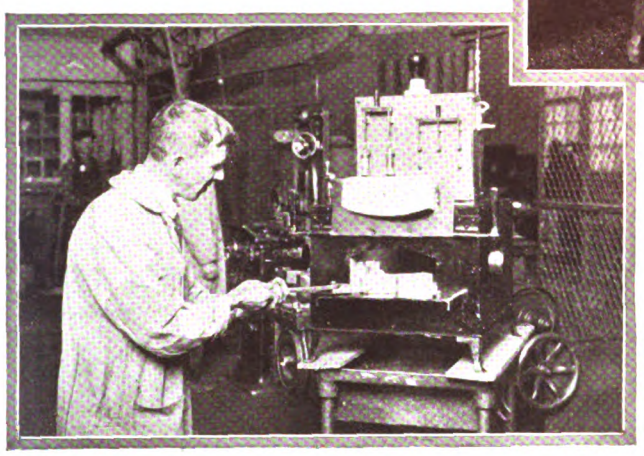
Recent Developments in Electric Heating Devices for Industrial Use

By A. N. Otis
(Industrial Heating Department, General Electric Company, Schenectady, N. Y.,

THE managers of many industrial plants have been quick to recognize the great advantages of electricity as a heating medium, and their adoption of it, in many cases on a large scale during the past few years, has given a very decided impetus to development, with the result that complete lines of apparatus are, or soon will be, available for electric heating, over the entire range of temperature from low temperature drying and baking operations, to the high temperatures required for melting and refining copper, brass, etc.



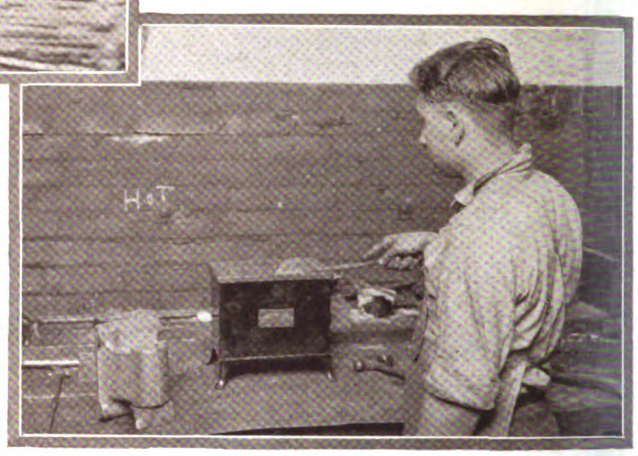
Electrically heated furnace annealing automobile springs. It is equipped with a revolving floor, so that one revolution takes just long enough to give a spring the proper treatment.



Electric muffle furnace for heat treating tool steel, etc.



Above, electric oven used in baking the acid out of "pickled" steel wire.

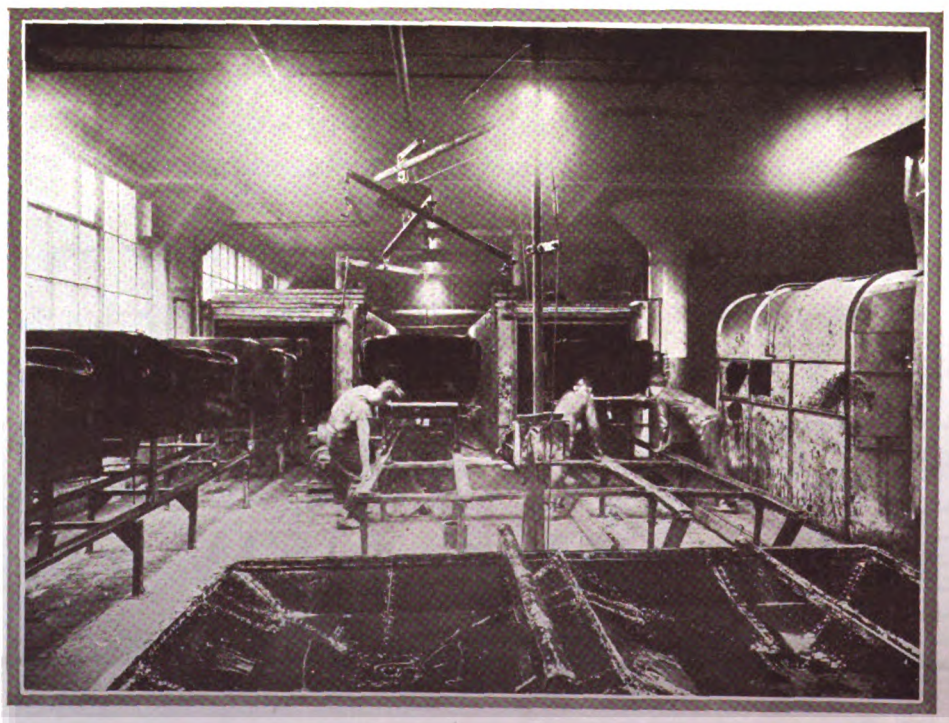


Small electrically heated, self-regulating metal melting pot for solder, babbitt, etc. It is typical of a line of small electrically heated devices for various purposes around a factory.

It is not the present purpose to describe any of this apparatus in detail, but rather to refer briefly to some of the more recent developments, and to indicate some possibilities for further effort.

With regard to electric ovens, it may be said that the general appearance and construction of such ovens and the heaters for them are well known, as their use has now become widespread for japanning; but there are other operations, particularly core baking to which they are especially adapted, as the dry heat, uniformly distributed and automatically controlled, results in perfectly baked cores in a considerably shorter time, thus eliminating the loss from defective cores, eliminating attendance, and greatly increasing production.

Metallic resistor furnaces are finding a wide use for such purposes as annealing, heat treating, vitreous enamelling, etc. For best results most of these operations require positive and accurate control of temperature, and uniform distribution of heat within the furnace, while some of them, notably vitreous enamelling, require that the furnace atmosphere be free from contaminating materials such as soot, sulphur, etc. Obviously electric heat fulfills all these requirements, with the further advantage that attendance, usually necessary to a greater or less extent, can be entirely dispensed with.

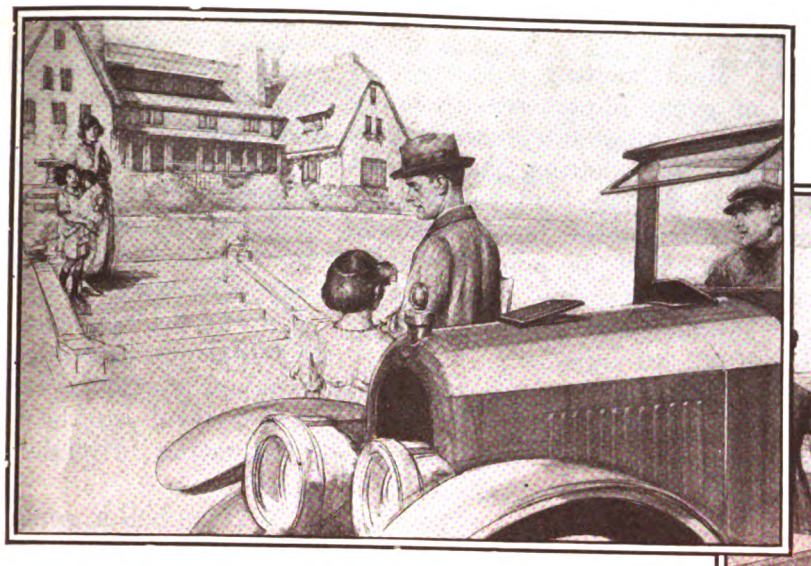


Body japanning oven in an automobile factory. These ovens are typical of the conveyor type that is being used to a great extent in automobile factories.

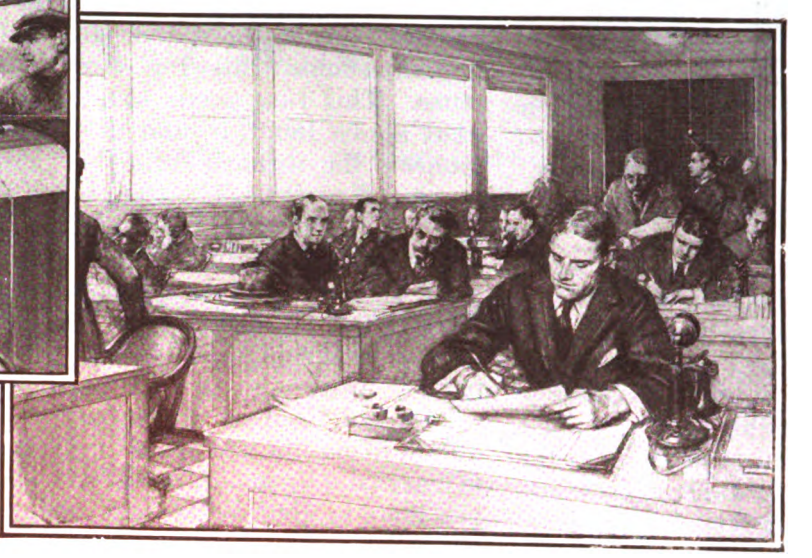
The furnaces referred to use heavy resistor ribbons, openly supported from the walls, so that the heat generated by the passage of current is readily dissipated into the furnace chamber. The ribbons, being massive, are strong mechanically, and as they are designed to operate at low temperature gradients, deterioration of the ribbons or burnouts will never occur, unless due to accidental injury or improper use.

(Continued on Page 28)

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At thirty-three he was the head of a promising little business of his own



At thirty-five he was back again at a job; a cog in a big machine

Will you be one of the 38.2%?

FIVE years ago a man of thirty took his savings, and the savings of some of his friends, and embarked in business for himself. He was honest, industrious and attractive; there seemed to be every reason why he should succeed.

Today, at thirty-five, he is filling a departmental position in a big concern—a position no better than the one he left five years ago.

What happened to his business that promised so much? Fraud? No. Lack of capital? Not primarily. Neglect? Not at all.

The trouble was with the training of the man. *He was an expert salesman, but he knew absolutely nothing of the other phases of business.*

The failures the Institute could prevent

HE could sell goods, but he was wholly ignorant of factory and office organization and control. Costs and accounting were foreign languages to him; transportation, advertising, corporation finance—he made mistakes in every one of them, and each mistake cost him money.

He belonged to the 38.2% of business failures whom Bradstreet groups under the tragic head: "Incompetence."

It is these failures—and those due from "inexperience" and lack of capital (which is merely another word for bad judgment)—that the Alexander Hamilton Institute can prevent.

For its Modern Business Course and Service is designed to round out a man; not to make him a better specialist in the single department he already knows, but to give him a working knowledge of all other departments.

Here are the Reasons why Men Fail
as reported by Bradstreet

CAUSE	
*Incompetence	38.2%
*Inexperience	5.6
*Lack of Capital	30.3
*Unwise Credits	1.3
*Fraud	7.0
Failure of others	1.7
Extravagance	1.1
Neglect	1.7
Competition	1.1
Specific conditions	11.3
Speculation	.7
Total	100.0%

***These are the needless failures that a well rounded business training would prevent.**

Lack of training in the fundamentals which underlie all business makes men *incompetent;* leaves them ignorant of the experience of others; rates them as poor risks for *capital;* blinds them to the ordinary safeguards of credit extension; and exposes them to all the frauds which prey on business ignorance.

That is why so large a proportion of the thousands of Institute men have stepped from mere positions into businesses of their own, and have achieved unusual success.

Will you work all your life in a routine job?

YOU may never have thought of it in this way but you are paying for the training of the Alexander Hamilton Institute whether you accept it or not.

If you do accept it, the cost is a little investment in money and time. But who can figure what the cost of indecision and delay may be?

Suppose tomorrow an opportunity comes in your present organization for a trained and self-confident man to step up into the class of executives? Or suppose some day you, with your savings and experience, start a business of your own.

Most men look forward to such a day—the day they will be made executives or go into business for themselves. It is the beginning of real independence. Will you be equipped when that day comes?

"Forging Ahead in Business"

THE Institute has helped thousands of men to shorten their path to independence. It makes no special argument; it asks only for an opportunity to lay the full facts before thoughtful men for their consideration and decision. The facts are gathered into a book of 120 pages, entitled, "Forging Ahead in Business."

It explains the Modern Business Course and Service in full, and tells just what it has done for other men in positions similar to yours. Any thoughtful man may have a copy by mail on request, and without obligation. For your convenience we attach a coupon and suggest that you fill it in now.

Alexander Hamilton Institute

252 Astor Place **New York City**

Send me "Forging Ahead in Business" which I may keep without obligation.

Name .....
Print Here

Business Address .....

.....

Business Position .....

Canadian address, C. P. R. Bldg., Toronto; Australian address, 42 Hunter St., Sydney.

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The Electric Furnace of Today

(Continued from Page 26)

A larger furnace is used for vitreous enamelling lamp reflectors, etc. This furnace has given very remarkable results in point of quality of work, rapidity of heating, elimination of rejects and increasing production, at the same time considerably reducing the unit cost of firing.

Another and larger furnace, of the car bottom type is suitable for annealing large forgings, castings, tool steel bars, coils of wire, etc. Five large furnaces of this type are in use or in process of erection at the present time, which is very substantial progress.

Although many manufacturers do not require the larger type furnaces, almost every manufacturing plant can use to advantage the small furnaces.

The smaller furnaces are of particular interest in that they have been designed to meet all the requirements of an ideal furnace.

First, the resistor, made of heavy ribbon, is formed into a self supporting arched structure which can readily dissipate its heat, and the muffle, usually present, can therefore be dispensed with. This is a very important factor, since it is the blanketing effect of the muffle that causes many burnouts.

Second—the resistor can be readily removed through the front of the furnace in case repairs should be necessary.

Third—the furnace is provided with positive and accurate automatic temperature control, which can be readily set for any desired temperature.

Fourth—high heat and low heat are provided, the former to give rapid heating in the morning, and the latter to give a mild soaking heat required for the working hours. The high heat and low heat are obtained by throwing the lever switch, shown at the right side of the control panel, to the upper or lower position. The automatic control is effective in both positions. About 1½ hours is required on week day mornings, and 2 hours on Monday mornings for the furnace to reach 1500° F.

Fifth—The furnace may be operated at 2000° F. with absolutely no danger of burnout, although it is primarily intended for operating at temperatures up to 1800° F.

Sixth—a temperature limit fuse is provided, to protect the furnace in case the automatic control should fail for any cause. This fuse opens somewhat above 1800° F. and disconnects the furnace from the source of power. The fuse is easily renewed. It should be withdrawn from the furnace when it is desired to operate above 1800° F. Usually this is at rare intervals and for short periods only.

The radiation or power required to maintain temperature is very small, about 2.5 KW. per hour at 1500° F. or about 30 KWH. per day including heating in the morning. Rarely will more than 40 KWH. per day be used under ordinary conditions.

The hearth area is 10½″ wide x 21″ long, connected load 5 KW. on low heat, 9.5 KW. on high heat for the furnace shown. A larger size is also available in the box type, hearth 18″ x 36″—door opening 18″ x 15″ connected load 20 KW. on 110 or 220 volts.

Cylindrical furnaces using the same general principles of design are also available. These furnaces are made in several sizes, having a connected load of 20 KW. on 110 or 220 volts.

It is thus seen that a complete line of resistance furnaces are now available in any size or type required.

Metal melting pots are also of great importance in many industrial plants, particularly pots for melting such metals as tin, solder, lead, babbitt, etc. The larger of these pots will hold about 900 pounds of lead, and the heating unit may be supplied for either 10 or 15 KW. 110 volts.

The heater may be made longer or wider for 220 volts if desired, and applied to existing fuel heated pots. These equipments are inexpensive, and their cost of operation is low. They may be equipped with automatic temperature control, and make a very excellent melting pot heater.

One of the most interesting recent developments is a resistance heated steam boiler, capable of being built in either large or small sizes. There are many localities where conditions are favorable to the installation of electric boilers, and the purpose has been to design a heating equipment which would be simple, rugged and reliable, and which could be built in any size.

The result is the well known horizontal fire tube boiler, into the tubes of which ribbon resistor units are inserted. The ribbon is bent into the shape of a long U, and suitable insulators are provided, spaced along the unit, which adequately support it and insulate it from the tube. There are thus two ribbons per tube so that a very considerable amount of energy may be expended per foot of tube, in fact the fuel fired rating of standard boilers can be exceeded.

These boilers may be supported on concrete saddles in any convenient place, and require no brick setting or stack. Furthermore, automatic control of steam pressure and water level can be provided, eliminating attendance altogether.

A large boiler, complete with automatic control board, having also swing doors at the ends to give access to the connection chambers, has been developed. The boiler is rated 1500 KW. 440 volts 3 phase, equivalent to a 150-HP. normal rated boiler.

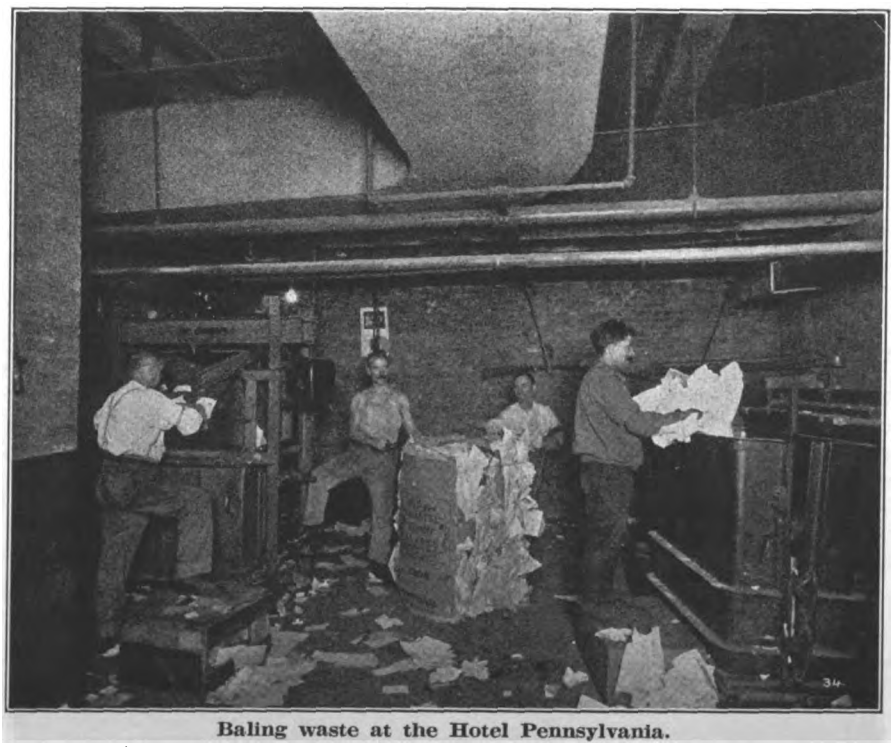
Automatic control of water level and steam pressure are obtained with standard boiler room devices, and are supplemented by protective devices which throw off the power and ring an alarm bell in case either should fail for any cause.

There is a standard hydraulic damper regulator mounted on the back of the panel, and used to regulate steam pressure by cutting in or cutting out groups of heating units by means of contactors. In the boiler shown the units are divided into 8 three-phase groups of approximately 190 KW. each.

As above stated, these boilers may be built in any ordinary size, or existing fuel fired boilers may be readily equipped for electric operation.

The foregoing will indicate in a general way the more recent progress made in the design of electric heating apparatus. This apparatus, which was so long in the experimental stage, today represents sound engineering and its extensive use in the future is assured. It is rapidly becoming an important source of revenue to central stations, many of which have organized departments to develop industrial heating business.

There are great possibilities for the electric industry as well as for the users of heating apparatus, and it is to be hoped that still closer co-operation between central stations and manufacturers may be secured. Such co-operation is essential if the utmost is to be realized from these developments.



Baling waste at the Hotel Pennsylvania.

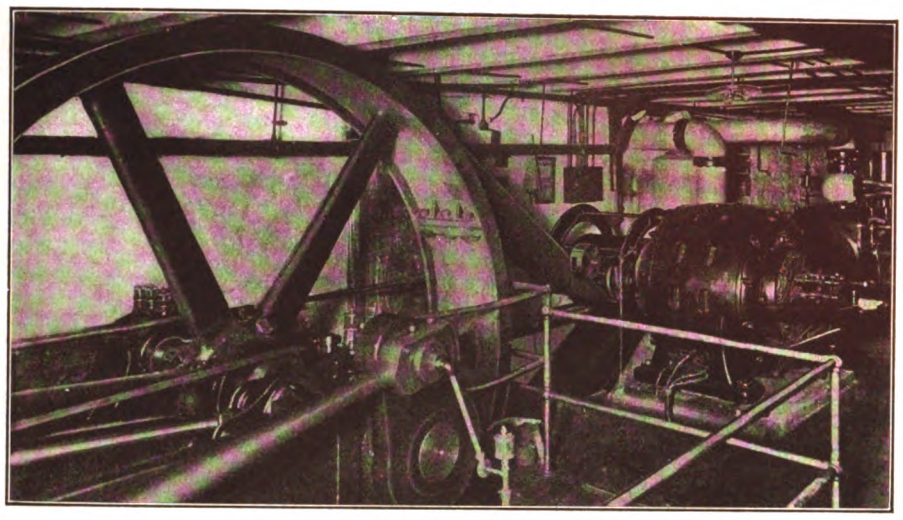
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In Your DRIVE FOR ECONOMY

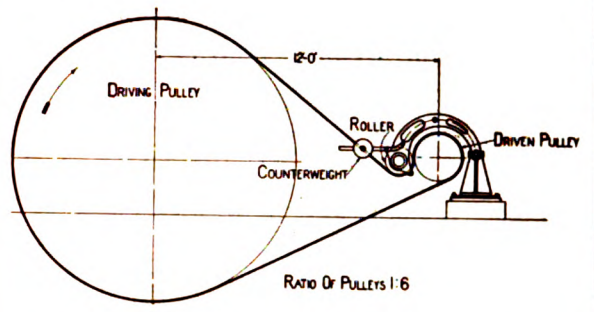
INVESTIGATE your power transmission costs, the power lost thru slipping belts, wear of belts because of that slippage and the burden of unproductive floor space occupied by long center, open belt drives. Our

SHORT CENTER BELT DRIVE

will eliminate these wasteful expenses and will save in INITIAL COSTS OF BELTS, MOTORS AND FLOOR SPACE. The maintenance cost of the Lenix Drive is practically NIL.



250 KW Steam Engine Driven Generator



Driving Pulley 144" dia., 27" face, 100 R. P. M.
Driven Pulley 24" dia., 29½" face, 600 R. P. M.
Double leather belt 25" wide
Pulley centers 12'0".

THE LENIX DRIVE is THE DRIVE FOR ECONOMY

This 250 KW Generator is driven thru a Lenix Drive by steam engine having a 12′ diameter pulley. The Pulley Centers are only 12′. The valuable floor space released for other purposes by this short center distance is apparent. The drive has been in daily operation since SEPTEMBER 1910. The belt shows no sign of wear. The LENIX DRIVE has required only three replacement bushings, costing $18.00, in ELEVEN YEARS.

Our booklet "Saving Slippage and Space"
describes many other interesting
installations of the Lenix Drive.

Ask us for it

F. L. Smidth & Co.

ENGINEERS

50 Church Street **New York, N. Y.**

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Should A Collection-Letter Be Humorous?

(Continued from Page 13)

reservations were as follows:

"First letter like the following. (This is one of our form letters:)

Dear Sir:

Referring to statement recently sent you as follows:

Jan. 6, 2-10-30 $25.00.....

If there is any error in the account, please advise us promptly. Otherwise, we will appreciate your favoring us with remittance.

2nd letter semi-serious

3rd letter serious."

The letter which follows is from a representative who had his headquarters in a city where there is located a manufacturing concern which has used and advocated the humorous letter—and which, incidentally, has since turned up its toes.

"The fact that the Blank Co. use this form is sufficient to condemn it. From personal observation in this locality of concerns that the Blank Co. has sent them to, it has closed many accounts. Through neglect of other departments controversies arose, payments were held up and along came the 'semi-serious.' Then it was 'CURTAINS' for all time on that account."

This reply is from one of our Chicago representatives.

"It seems to me the lighter vein implies an intimacy which is quite unusual between a credit department and the person or firm addressed, and in a majority of cases would either be resented or ignored, neither of which is the desired result.

One of our New England representatives was not only indignant but a little sarcastic.

"As I understand it," he writes, "a collection letter is to collect a past due account and not to amuse the reader. He usually pays admission for that sort of thing."

In this connection the opinion of our sales manager should be of value. He brings to the discussion a former experience of many years as Credit Manager. "If you knew your man," he told me, "a semi-serious letter might occasionally be successful. Otherwise I do not believe it would be advisable and," he added astutely, "a man would have to be a Mark Twain to do it."

The final chapter of this investigation was written just a short time ago, when the branch manager whose interest in his work prompted him to write to me suggesting the semi-serious letter was in our office. We had quite a little correspondence on the subject and I asked him to read over on his way back a paper I had read at a conference of business men embodying this correspondence, the result of the questionnaire and some deductions of my own.

He returned it to me enclosing with it the following letter:

"I am returning herewith your article which I have just finished reading with feelings of joy and embarrassment.

I surely was all wrong about the semi-serious credit letter and I can see now that that would never do."

Mr. F. O. Letts, President of the Western Grocer Co., whose booklet on collections many of you have doubtless read, has proven to his own satisfaction that close collections increase sales.

We felt that our symposium on the semi-serious collection letter would not be complete without an opinion from Mr. Letts and he was kind enough to write us as follows: "With me, 'close collections' has been a pretty serious affair and, therefore, I feel just at the present time with the financial situation as it is, that I can hardly approach the subject from the angle of a humorous or sem-humorous letter."

Perhaps I should say as to the results we have been getting through our letters. Our terms are 30 days net, 2% off in 10 days. In 1920 our invoices on basis of 30 days were paid in 29 days and our percentage of Accounts Receivable to Sales was 97. For the first 10 months of 1921 our bills were paid in —— days and percentage of Accounts Receivable to Sales was ——. While these figures are by no means extraordinary they seem to me to indicate satisfactory result considering the terms upon which our business is done and the fact that we deal with a multitude of retailers, doing business in a comparatively small way, also with many schools and public institutions which must depend upon appropriations, tax collections, etc., and are, as a rule, quite slow.

So not only did we decide after this rather thorough consideration of the question of attitude in collection letters not to take Jim's advice and use the humorous variety but Jim was himself won over to our way of thinking. He even furnished us with some characteristic ammunition. "Hank is like quite a few other hustling Americans," he told us in confidence. "He slows up like the devil when it comes to paying a bill. I can see now that he don't need any encouragement to take a past due account semi-seriously. What he needs is something to speed up that check writing machine of his"—and, he admitted, "so do I." "What is more," he added thoughtfully, "we will both be more prosperous and consequently the more happy for it."

Illustrating the Sales Talk

(Continued from Page 16)

stock to consumer-partners, to provide for construction as mortals actually do in daily life. These scrap books were a success, but—well, something was lacking.

"One day the salesman of a check protecting machine called on me. I was only mildly interested in the subject, interested enough to grant him a hearing, but far from 'sold' on his proposition. Nor did his sales jargon or technical talk make much of an impression. He knew his machine, he worked hard, and he presented his points and arguments clearly, but he was not getting away with it. Finally he pushed a sample check toward me.

" 'Please sign this check,' he requested. I did so.

" 'Now,' he said, 'let me show you how a forger works.' And turning my signature upside down he took the pen and drew an imitation so exact that it would pass anyone, even myself, unless subjected to close scrutiny.

"Immediately he had my interest. He explained how the trick was done, quoted some figures on the losses sustained by business men through forgery, started again on his selling effort—and went away with my order for a machine that I didn't especially need and which at the time was an extravagant purchase.

"That demonstration set me thinking again. 'Why not,' said I to myself, 'why not devise a scheme like that to sell electric cleaners, or washing machines, or any other electrical merchandise? To be sure, we can't send cleaner salesmen around with a side-line of forgery to get orders, but—'

"Well, I thought it over, forward and back, and began to experiment. First I found out what it was that people most want to know about cleaners. They want to know the inherent differences between the several types — the air alone type, the motor-driven brush type and the friction brush type. They want to know how each type of machine works and which is the best. So I studied to discover a simple illustration or diagram that would make these differences plain—a diagram, moreover, which any salesman, no matter how unskilled in drawing, could render effectively. Fig. 1 is what finally was developed.

"The oblong and square represent, respectively, the two kinds of dirt found in an ordinary carpet or rug—about 80% dust and imbedded dirt, and 20% surface dirt and litter.

"Now, the first type of elec-

(Continued on Page 32)

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Daily Signal Information Methods

An organized routine designed in such a manner as to present each day the exact result of the previous day's activities.

As Applied to PRODUCTION:

these methods serve to point out losses due to inefficiencies in productive operations or operators. These facts are presented promptly and in time to permit executive attention.

As Applied to COSTS:

these methods provide a basis upon which to establish predetermined standards against which are reflected the dollars and cents results of each day's activities.

As Applied to ACCOUNTING:

these methods include a condensed, summarized, daily trial balance, together with such detailed supplements as are dictated by the specific requirements of each installation.

Out of our experience of THIRTY YEARS in the field of

INDUSTRIAL ENGINEERING

AND

PUBLIC ACCOUNTING

we have developed the principles around which we have constructed the details incident to the successful and satisfactory operation of methods which will provide you with

DAILY SIGNAL INFORMATION

(We are distributing FREE to responsible executives our interesting booklet, PREDETERMINED COSTS. Have you received your copy? If not write for it on your business correspondence.)

McCall, Brownell & Company, Inc.

Industrial Engineers and Analytical Accountants

Aeolian Building **New York City**

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WITH its variable conditions from day to day, wavering from heat to cold and unstable as to its moisture content has called upon man's resourcefulness to make all habitations livable.

While the Earth turns daily upon its axis giving alternate sunshine and shadow and darkness with gathering clouds and rain and storm ever imminent.

With wind and calm and fog, with snow and ice tempered now and again by balmy breezes and bursts of radiant sunshine, no one can tell what the morrow will bring forth.

Even where nature has full sway far from cities' contamination, the inner space where men dwell and work or study or play are subject to those uncertain vagaries so hard to overcome.

And in the metropolis close by the forge or mill or bordering on cities' streets, life becomes almost unbearable.

The scientific application of nature's laws has made it possible for man to produce and maintain within the confines of modern buildings an atmosphere of comfort just to his liking and where the chemist or manufacturer requires a certain temperature and humidity to make his product work hour after hour and day after day without variation in quality and quantity, he has had the means at hand.

Apparatus for cleasing the air of dust and foreign matter, for warming it in winter months, introducing the proper percentage of humidity to maintain an ideal and predetermined condition. The reduction in temperature of the summer air, moisture laden as it often is, so that the temperature readable only by the wet bulb thermometer may be under control, are all a reality.

Webster Air Washers and Air Conditioning Apparatus with the Webster System of Automatic Humidity Control are adaptable to practically every type of building and industry and to those who wish to know what can be done to improve conditions in any particular instance, we are at their call for consultation and service.

Atmospheric Conditioning Corporation

469 Chestnut Street PHILADELPHIA

(Continued from Page 30)

tric cleaner, which cleans by air without the aid of a brush, can be represented by a circle, and its motion is conveyed by rapidly whirling the pencil round and round (as in Fig. 2).

"Such a machine, we claim, removes a very large percentage—practically 100%—of the dust and imbedded dirt, but it normally retrieves only about one-third of the surface dirt, which fact we have indicated by the shading.

"(Right here permit me to say that I am interested in the manufacture and sale of a machine containing a friction driven brush, and while I believe my statements herein to be true, I appreciate that they may be challenged by makers of other types of cleaners. However, this is a demonstration of *a method of selling,* not a presentment of our claims as manufacturers, so I commend to my readers *the idea* underlying these diagrams and ask them to disregard the figures which I employ in making that idea clear. But to continue—)

"The second type of machine is that having a motor driven brush belted or geared to the same shaft which carries the suction fan. This is represented as in Fig. 3.

"We say that this type removes somewhat less, say 70%, of the imbedded dirt, but that it quite thoroughly gets the surface dirt and even some of the surface itself.

"Finally there is the friction driven brush type of cleaner in which the suction fan and brush operate independently.

"Naturally, we claim for our own machine the maximum efficiency in retrieving both imbedded and surface dirt, so that the effect of this type I represent by the shaded lines, (Fig. 4).

"Disregard, please, these figures which we use in our own sales work, and center your attention upon the pictorial idea which I have presented; I believe you will agree that this method of illustrated salesmanship has great possibilities.

"As the salesman sketches up his diagram, he of course maintains a running fire of exposition and argument. The prospective customer's attention is riveted upon the flying pencil; the explanation and figures are visualized and vitalized; an impression is made upon the mind, upon the *understanding,* which is not only much clearer but *much more permanent* than any mere vocal presentation could possibly be.

"The idea has almost limitless possibilities in appliance selling; as, for example, in explaining the operation of an oscillating type washing machine in which the water swashes back and forth in the form of a figure eight. The mere action of the salesman's pencil (Fig. 5), swinging forward and back, looping over and under, conveys the impression of exactly how the water in such a machine moves to perform its cleansing work.

"Of course the experts in illumination use such diagrams frequently and effectively, but I believe that there is room here also for central station solicitors, fixture salesmen and those who retail lighting service to commercial and industrial customers, to develop and elaborate similar pencil demonstrations.

"Mr. W. F. Clark of the Automatic Electric Heater Company uses a clever diagram to show the siphon action of his sepco water heaters. He first draws a rough outline of the unit, and then sketches in a number of little arrows to show how the heating water circulates through and around the unit. An impression of movement and action is given by the pencil strokes; the finished diagram, while necessarily inaccurate, nevertheless conveys a vivid and permanent impression of a pipe spouting out hot water (Fig. 6), which is the point he wishes to emphasize.

"The use of sketches and diagrams in advertising is not new, obviously, but the idea of developing them in simple form to serve as made-while-you-wait illustrations to a sales talk certainly deserves our thought. It enables the salesman to control both the eye and the ear of his customer; it insures that a definite and lasting impression is registered; best of all, it lifts the solicitation out of the rut, strips it of coldness and gives it a desirable distinction. The cleaner diagrams which we use in our

(Continued on Page 36)

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Does 1922 have to show profits?

Many concerns have not only exhausted their surplus but have created deficits due to 1921 losses and it is essential to their business life to make profits during 1922.

Bankers and those financially interested have stated that the position of these companies must be recovered either thru mergers or improvement in management operations.

In either case this really spells waste reduction and bears out our experience that while the more obvious profit-making possibilities have been exploited even larger opportunities remain thru turning preventable losses and wastes into profits.

The principal source of profits during 1922 will be this reduction of wastes.

We are securing additional profits for our clients thru programs which incorporate such features as definite financial sales budgets and forecasts, complete survey and X-ray of all operations, sales and market analysis, stabilization of production, cost reduction, overhead studies and many others.

We are prepared to submit facts and figures covering actual results secured.

If you request it, we will send, without obligation, not a salesman or solicitor but a firm member thoroughly familiar with such typical cases, who has supervised some of them himself and who is qualified to specify the kind and amount of service which will secure results for you.

Knoeppel
Organized Service

"We can describe our plan briefly"

C. E. KNOEPPEL & CO., Inc.

Industrial Engineers

52 VANDERBILT AVENUE NEW YORK

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Are You Thinking Beyond Your Job?

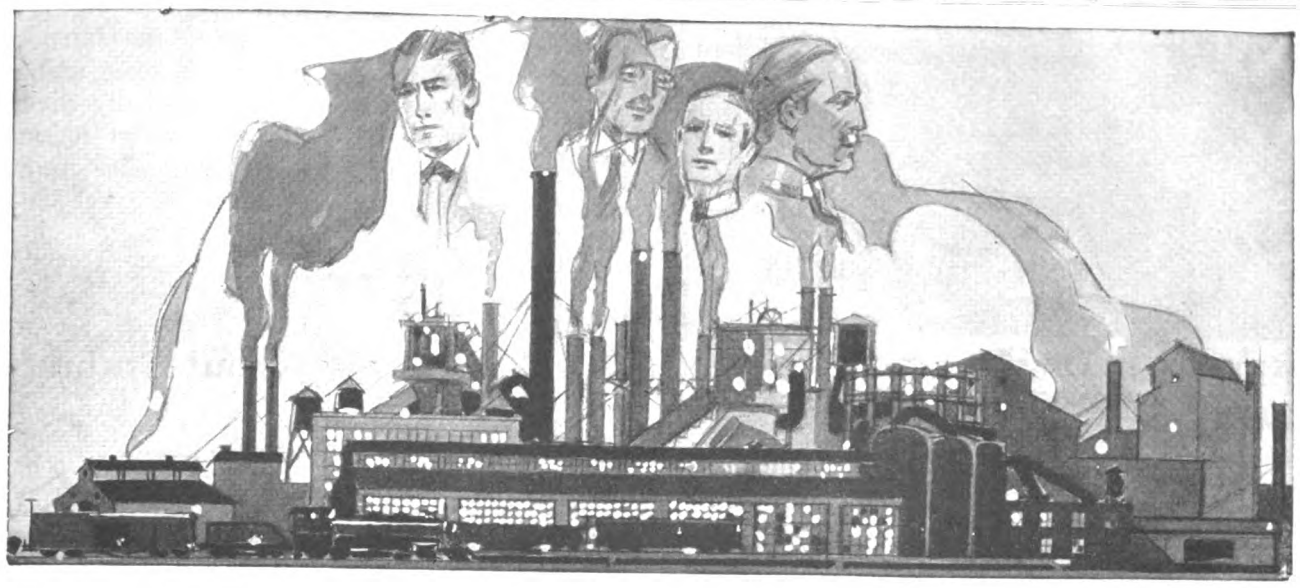
You can't stand still----if you are not going ahead, you are falling behind.
Do you want to know the secret of success?

INDUSTRIAL EXTENSION INSTITUTE,
9 East 45th Street, New York City

The only Complete course in Industrial Management

Copyright 1922, Industrial Extension Institute.

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Why Men at the Top Stay There

Do you know what the executives in your firm are doing to keep themselves "fit"? Find this out, and you will get a pretty sure tip on the secret of their—for your own guidance.

A recent analysis disclosed the fact that men already holding executive positions form the biggest class of any enrolled in the Factory Management Course and Service, of the Industrial Extension Institute.

Executives in our classes

Taking the last 1,000 men enrolled for the Course and Service, we found 330, or 33%, of them are managing executives.

Every man listed under the heading "Executives" is holding a position either as a President, Vice-President, Secretary, Treasurer, Manager or Superintendent. It does not include any man below the position of Superintendent, and one of every three men enrolled is holding an executive position of this caliber.

Although this Course was designed by some of the country's finest experts for the purpose of training men employed in various lines of production work and fitting them for executive positions, we find that men already in executive positions are realizing its benefits more than any other one class. This shows clearly enough what the men who already have made good think of it.

You Need Not Be a Manager

Suppose you are a foreman of a machine shop, or a cost keeper, or a designer. Do you understand the principles of finance, costs, planning and scheduling, power plant, equipment, tools, and patterns—all working *together* to make a profit? Are you *fitted* to take a bigger job?

Tomorrow's Problems

You may say, "Well, I am a lathe man. I'm not interested in cost production and that sort of thing." But the problems immediately before you today are not necessaries the ones to concentrate on.

Acquaint yourself with the problems outside your own little niche in the factory. You can't tell when a bigger opportunity may be offered to you in some different line in the same factory which would be a great step ahead for you. Will you be prepared in advance? On the other hand, you know all about costs, but are you prepared in the other features of production?

1,000 ENROLLMENTS— FACTORY MANAGEMENT COURSE		
Executive	33%	330
Engineering	18%	180
Industrial Relations	16%	160
Accounting	15%	150
Production	12%	120
Materials	4%	40
Educational	1%	10
Miscellaneous	1%	10
Total	100%	1000

In the fields of production other than your own, where you haven't had the opportunity for experience and study, you can certainly profit by the valuable experience of men who have been a distinct success in those fields. That is just what Industrial Extension Institute offers you—the life experience and guidance of 60 of America's great est experts.

IF You Will Let Us

We can help you very much, but you have to be in a receptive mood. This Course is for men of ambition, fixed purpose, and determination to get beyond the job they are in. It has no place for slackers, wishers, drifters, but it can help any worker who will invest a little tmie, thought and money in his own future.

This Book Has Started Hundreds on the Right Road

We want every machinist, skilled worker cost accountant, foreman, draftsman and engineer to have this book.

"Thinking Beyond Your Job"

Let us show you what we are doing for men just like you, with no more training than you have. Tear out the coupon and write for your copy of the book today. Sent without charge, upon request.

SIGN THE COUPON. MAIL IT TODAY

INDUSTRIAL EXTENSION INSTITUTE
9 East 45th Street, N. Y. C.

Please send to me without obligation your free booklet "Thinking Beyond Your Job."

Name _____

Address _____

Present Work _____

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The Copes Operates In Synchronism With Changes In Water Level

The Copes thermostatic tube expands or contracts in unison with the fall or rise in water level, within the boiler. This is due to the fact that the heat conduction is practically instantaneous. Therefore the full force of the expansion tube is immediately available. There is no lag as must be the case in a float or displacement member where sufficient water must first be displaced to overcome the friction of the moving parts.



Copes Boiler Feed Regulators

The Copes is "geared" to the actual water level. Accuracy and complete reliability in feed water control are therefore positively assured.

This is one of the reasons why Copes Regulators save 2 to 8 per cent of the fuel. Get all the reasons. Ask for Bulletin "K."

Northern Equipment Company,

101 West 11th St., Erie, Penna.

Branch Plants; Hamilton, Ontario; Manchester, England; Paris, France; Cologne, Germany.

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(Continued from Page 32)

own business have proven very effective.

"The salesman need not be adept with his pencil to utilize this idea. He must, of course, develop his design or diagram and learn it 'by heart' so that he can repeat it always in the same way without hesitation and with full effect. But once he has his diagram worked out, even the crudest rendering of it on the back of an envelope will serve his purpose. The customer's eyes and ears are both undividedly given to the salesman when he makes an illustrated sales talk of his product.

What Do You Know About Anthracite?

(Continued from Page 20)

heit is, on the authority of health experts, the proper temperature, many of us lean toward from 70 to 72. With steam heat, there is a tendency toward excessively dry air. Just try the experiment, some time, of the effect of evaporating-pans on the steam radiator. *Moist* air at 68 is just as comfortable as *dry* air four degrees higher, and far more healthful—while the fuel required for those extra four degrees is well worth saving.

Next to the domestic consumer, the largest users of anthracite are the electric light and power companies, who use very nearly one-third of the total. If domestic heating installations could attain the efficiency shown by these public utilities, our household coal bills would be cut in half. But we cannot hope to do more than approach that result. Just as the automobile engine never can show a fuel economy as high as that of the stationary engine, so the household furnace—because of constantly fluctuating demands, impossibility of installing efficient stoking apparatus, and similar inherent limitations—must inevitably waste *some* fuel.

Our tendency toward overheating our homes accounts for only a part of that seventh wasted shovelful which could—and *should*—be saved. Lack of attention to cleaning the heating surfaces, leaks of air around the ash-pit and fire-doors; each of these takes its toll in fuel. Faulty insulation of steam pipes (which is often worse than no insulation at all, as it provides a larger radiating surface) accounts for a sizeable portion. Faulty regulation of the draft controls is another source of waste; we let the fire get too low, and then use too much coal in getting up a good heat again.

Some ten or fifteen years ago, the saving of one-seventh on our coal bills would have amounted to perhaps six dollars in the course of a season in the average household. Naturally, it was difficult to see how an expenditure of ten times that sum on insulating the pipes, would be worth while. Nor was it possible to consider thermostatic control of drafts—at a cost of from fifty to one hundred dollars—except in the light of a luxury. Today, however, with household anthracite at nearly fourteen dollars a ton, more and more people are becoming interested in anything that will help to cut this growing item of the household budget Storm-sash, weather-strip, steam-pipe covering, thermostatic draft-control—every one of these things is worth while; and every one of them soon pays for itself in fuel saved.

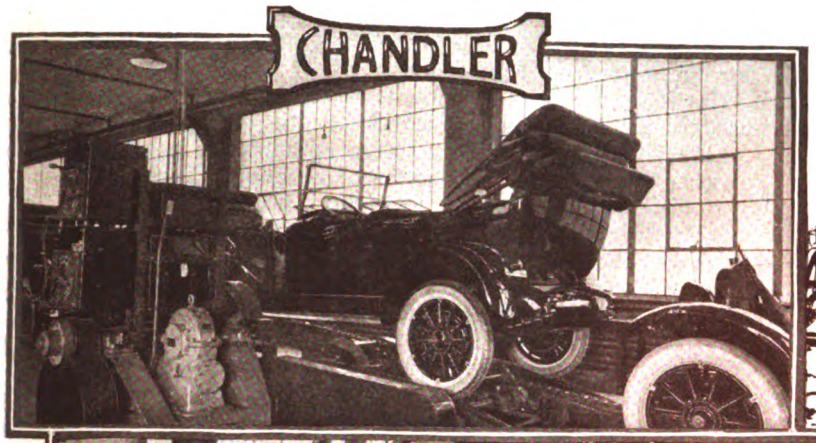
The day is not very distant when anthracite will no longer be available; when we shall have to use coke, instead. But coke is a story in itself. Meanwhile, a little more intelligence mixed with our household fuel would not only help the general situation, but would materially lighten the strain on the individual pocketbook.

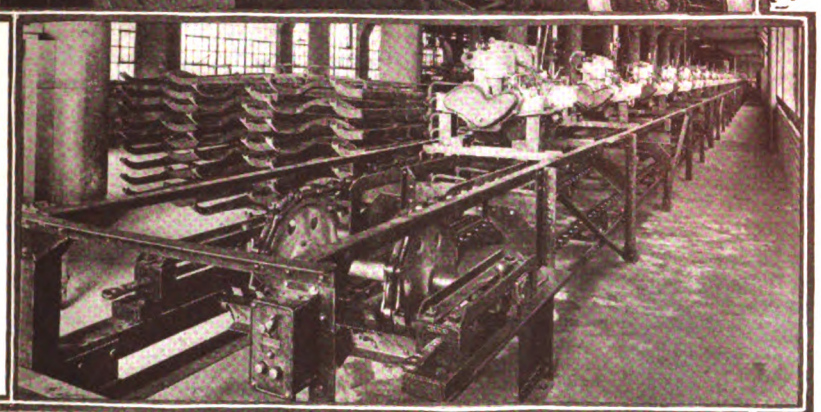


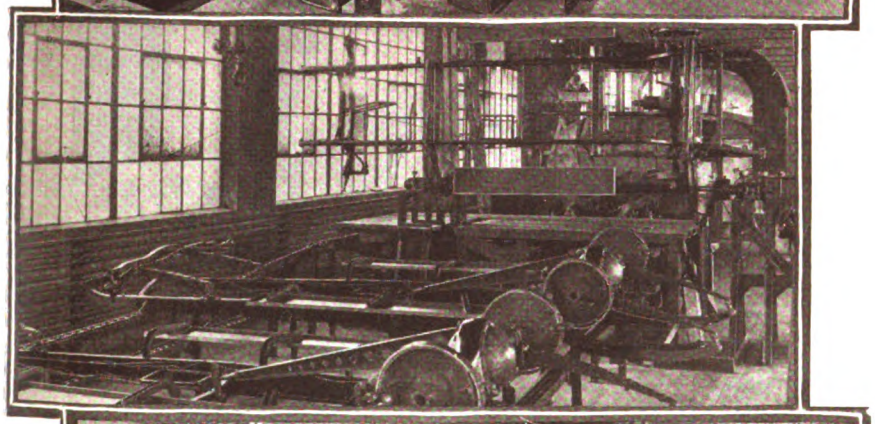
Locker room for employees. Hotel Pennsylvania.

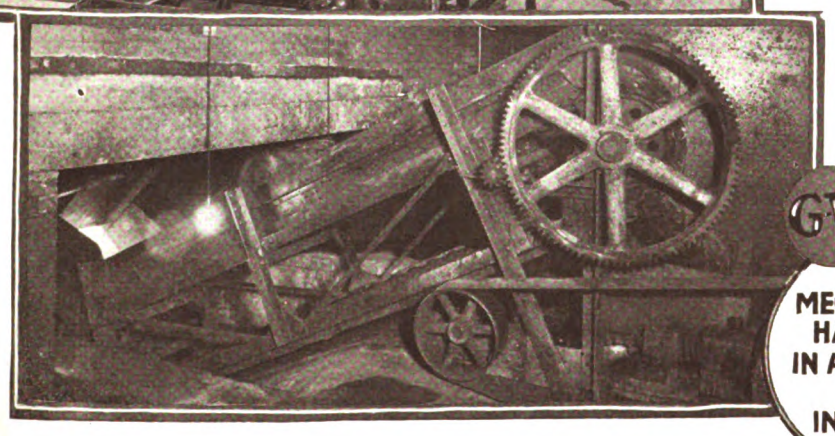
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Chandler Motor Car Plant Gifford-Wood Equipped from Coal Bunker to Shipping Platform











Speed- with Economy

WHAT car do you drive? No matter the make, if it's up-to-the-minute in lines, design, equipment, finish—yet moderate in price—it has been produced by a plant where speedy production has meant economy.

Nowhere is such efficiency more manifest in tangible dollar value than in the Chandler Six. And Gifford-Wood systems play a mighty part in the program—from coal and ash loaders and unloaders to engine assembly carriers, chassis assembly moving platforms and turnovers, body carriers, and elevator-sthrough all progressive manufacturing steps, right up to finished assembly, final inspection, and shipment. The photographs shown are just afew flashes of the whole system.

Gifford-Wood economy begins with its installation—enduring, built-in value adds savings in maintenance to savings in production. Startling as the results are in the automotive industry, they can be paralleled in other lines--in yours. Let us study your plant and make recommendations. Costs you nothing—may save much.

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MECHANICAL HANDLING IN ALL LINES OF INDUSTRY

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The Gifford-Wood Company specializes in the manufacture of elevating and conveying machinery for all lines of industry. Gifford-Wood Products include elevating and conveying machinery of all sorts for handling coal, ashes, stone, sand, gravel, ice (manufactured and natural), and other bulk materials; wagon loaders; locomotive coaling stations; pivoted bucket carriers; warehouse conveyors; car unloaders; coal pockets; screens and chutes; friction clutches; hoists; ice elevators, conveyors, and tools; gray iron castings, etc.

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Your Skilled Mechanics Make Wasteful Time Clerks

Permitting your skilled mechanics to keep their own time records with pencil and paper is a costly practice.

One man may only waste fifteen minutes a day. But one hundred men at the average rate of 30¢ per hour will spend $2,250.00 in a year. And there will be no return on the expense. It will be waste, pure and simple.

But that is not all. Records made by employees with a pencil are usually inaccurate. Often they must be taken back to the workman for "another guess." To the lost time of the workman is added that of a clerk.

It is rare indeed that a skilled mechanic is a good penman. More often their records are illegible. Again the time of both clerk and workman are lost interpreting old records.

A Calculagraph, properly installed, saves both money and time.

It will save two-thirds of the losses of one hundred men. And that alone will amount to $1,500.00. At the same time it will insure absolute accuracy and legibility.

The Calculagraph will record starting, finishing and elapsed time on every job. It eliminates the work of subtraction. It prints the figures clearly on a job card. And it makes errors impossible.

Strong Moral Effect

The moral effect of measuring time with a machine is bound to result in increased production. Employees pay stricter attention to their work. They watch the time they are consuming. A small increase in production will pay for a large number of Calculagraphs.

Send The Request Form for Booklet

What is the Calculagraph?

The Calculagraph is a time meter or *elapsed time* recorder. It records the starting, finishing and elapsed time of a job. By its use the necessity of subtracting the starting from the finishing times of jobs is entirely eliminated. The elapsed time can be read directly from the card.

Our Calculagraph will compute and print elapsed time for any number of workmen.

Cards or tickets of various sizes and shapes may be used; usually your present card will do.

One model prints the elapsed time in hours and minutes, another type in hours and tenths of an hour. There are also different models for computing elapsed time for maximum periods of twelve, twenty-four, and sixty hours.

Its operation is simple. One backward-forward movement of the right hand lever when the job starts, a pull on the left hand lever when the job is done, and the time record is complete.

Its installation is as simple as that of an ordinary clock. There are no wiring connections. The Calculagraph may be fastened to any shelf with screws or it may be left free to be moved about.

There are no holes or notches punched in the cards. The result is a printed record of starting, stopping and elapsed time which cannot be altered or fixed in any way.



THE CALCULAGRAPH
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34 Church Street **New York City**

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34 Church St., New York City.

Date.....1922

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Name.....

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What's the Use of Catering?

(Continued from Page 24)

the training we've been giving these men," suggested one of the executives finally. "We've been teaching teamwork and efficiency in their foremen's classes and other group meetings. Why can't we turn over to them now the job of caring for this necessary reduction? It's simply asking them to apply their training in a practical way. And it's showing a confidence in them that I think they'll appreciate."

The suggestion was adopted. The company referred the problem to its plant executives, foremen, and other departmental supervisors. It explained that additional economies were necessary to the welfare of the business, and asked its squad leaders to look into the organization and personnel of their departments to see in what ways the principles of modern production might be applied to this end. In other words, the company asked its men to take their training seriously and put it into practice.

And they did. Within a few days voluntary recommendations of curtailment were received from department heads in various plants and offices. They recommended the elimination of 2800 salaried positions. When the committee of executives came to total the salaries involved, they found that the saving would be $4,500,000 annually, instead of the $2,000,000 they had figured!

I was reminded of this incident this summer, when, in conversation with an industrial manager in New York, the idea was advanced that a care for the employee's point of view is necessary only in time of labor shortage. "When job-hunters are falling over themselves scrambling for work, what's the use of catering?" said this executive. "You can pick and choose as you like, and fix your own wage and salary scale, and it's take it or leave it with them. They're the ones that have to do the catering nowadays."

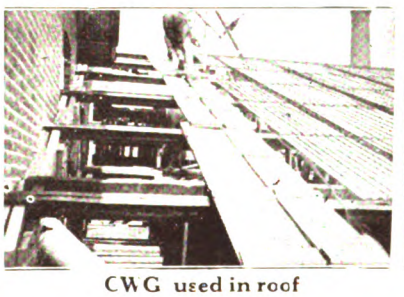
This may be an extreme case, but the attitude is by no means uncommon. Nor is it surprising that a harried employer, reacting from the industrial disturbance of the last four years, and beset by the consequences of the buyers' strike of the last year, should feel that now it is his turn. It is human nature to want to get even.

"But what are we in business for?" said an experienced industrial engineer, himself the head of an important industrial plant. "Are we in business to get even? Were all the industrial lessons we learned in war just emergency measures, to be used only in time of high pressure? Was all this talk of teamwork and coöperation then just a smoke screen under which to speed up production, of no value after the emergency has passed?"

Not long ago a New England company had its factory wiped out by fire. It took eight months to rebuild. During all that time the company kept its entire force of foremen and a large squad of skilled operatives on the payroll. "The most valuable assets we had were the goodwill of the public and the efficiency of our organization," said one of the executives of the company in explaining the why of their unusual policy. "We figured

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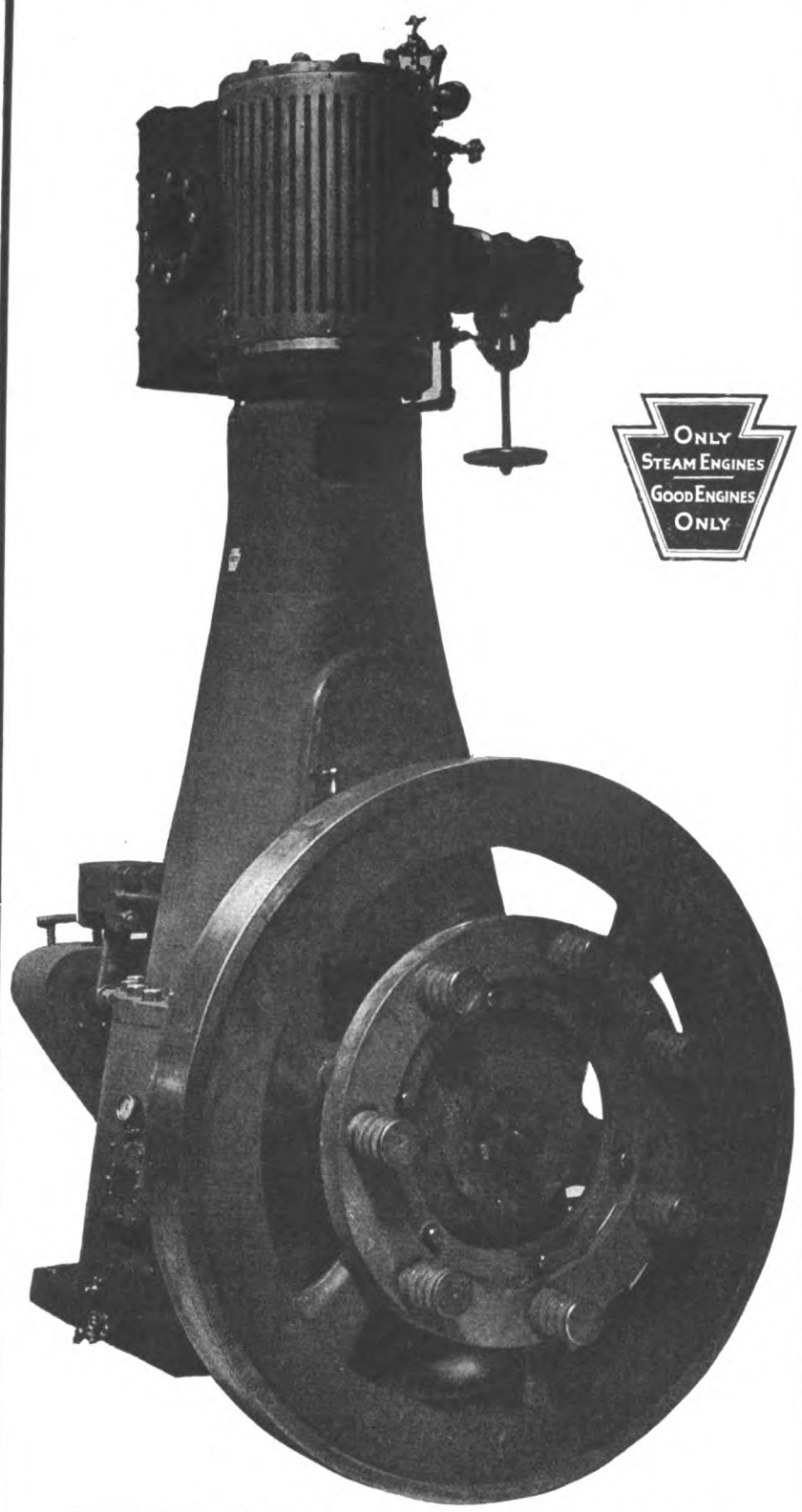
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that it was less expensive to keep our organization alive by retaining the key men, than to let them go and depend on building up a new organization when the new factory was ready for them. The goodwill of the public depended directly on the quality of our production, and the quality of our production hinged in turn on the efficiency of our organization. Our policy was not charity to our employees, but good business for ourselves."

An electrical manufacturing concern learned the importance of conserving essential elements of its organization through an experience several years ago. In the stress of a financial panic, it dropped its research department. The stringency passed in a few months, and with the revival of trade the absence of the research department began to make itself felt. Several years and the expenditure of considerable money were necessary to get together another force of trained technical men and put the company's research department back where it was. The lesson thus learned has not been ignored. When the depression of last winter hit industry, this particular company actually increased its appropriation for research.

Within the past year a rubber company in Wisconsin found it necessary to reduce its force. Many plants in that line were then running at fifty per cent capacity; this plant had to curtail below even that level. In spite of the heavy cut in the organization, however, the management announced and adhered to this policy: "We will preserve our supervisory force intact and will make every effort now to increase their morale and effectiveness, so that when business opens up again the key men of our manufacturing organization will be functioning better than ever." In furtherance of this policy, the company adopted a system of foreman training, and for several months the production executives, foremen, and a few chosen operatives went to school together in the plant, studying their equipment, organization, and methods, and considering how they might make them more productive.

Industrial training is not a new element in American factory work, but a type of industrial training was developed during the critical years of the war that is new. This new type of training is concerned primarily with the psychology of industry. It gives little attention to the technique of particular trades or processes. It teaches economics, gives a broad view of industrial organization, helps the individual to see his part in the organization, gives him a sense of the dignity, importance, and worthwhileness of his work. Its object is to motivate the men rather than to instruct them in the details of their particular jobs. The effect, however, is to make them more alert and intelligent in their jobs. Principles are taught rather than specific methods; and in some plants where this system of education has been installed, some rather striking results have been reported.

Here is one instance, borrowed from the experience of a New Jersey factory.

There was a strike brewing among the laborers last winter. The management proposed a modified scheme of shop councils to adjust grievances, but the men did not warm up to the proposal; and just about the time the plan was to go into effect, a strike occurred. At about the same time, it happened, a foreman's class, which had been arranged for during the preceding summer, was organized and began its weekly sessions in the New Jersey plant.

The foremen's course of training began with the study of industrial teamwork and the principles of handling men. It was not long before they began to apply these principles to their own plant and departmental problems, and particularly to the trouble with the disgruntled laborers. Presently the foremen suggested that they would like to appoint a committee from the class to meet with a committee from the workers. This was promptly approved by the management, conferences were held between the two committees, and all the questions at issue were thoroughly discussed. It was no mealy-mouthed discussion, either. The difficulties were frankly faced and gone into in man-to-man fashion. But the foremen had got a new conception of their office and were able to present the position of the management with

(*Continued on Page 43*)

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THE year 1922 is going to be a year of re-established profits, in spite of lower prices—sane, legitimate profits resulting from a closer scrutiny of the costs of manufacture.

THE belt for 1922 is the belt which involves the least amount of non-productive time, which transmits the most power per dollar and gives the longest service per dollar.

TELLING you what "Dickbelt" has done in other plants, is not PROOF of what it will do in your plant; it is merely evidence. Putting a "Dickbelt" in your plant, in competition with the best belt you have yet found—with a GUARANTEE that unless it satisfies you on every score, your money will be returned—THAT IS PROOF.

Every time a belt slips—every time a belt wears or breaks down—it contributes a definite amount in dollars and cents toward wiping out an already restricted margin of profit.

We guarantee that if "Dickbelt" fails to live up to the claimed specifications, or if for any reason it fails to give you complete satisfaction, your money will be returned without quibble or hesitation. And—the first-cost of "Dickbelt" is no higher than that of the best leather belt.

"Dickbelt," the Original Balata Belt, has been manufactured for more than thirty years. In that time, it has made good with thousands of users—in transmitting power, in elevating and conveying service. And in all that time "Dickbelt" has been sold always subject to a guarantee of complete satisfaction. More than thirty years of experience in thousands of plants, both here and abroad, have proved that "Dickbelt":

1. Transmits more power than any other kind of belt, absolutely without slip.
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Fill out the coupon below, and send it to our main office today.

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☐ Please quote on a belt for enclosed specifications.

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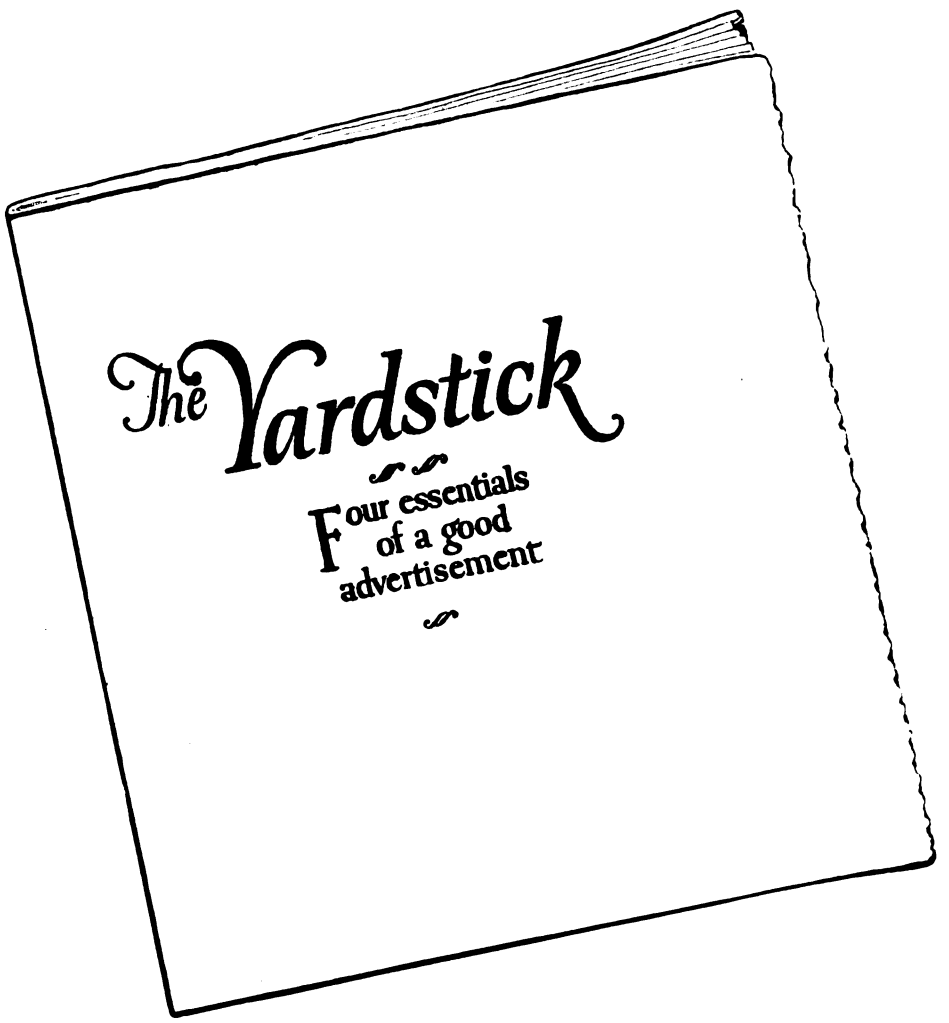
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(*Continued from Page 40*)

conviction and intelligence, and at the same time to recognize and understand the position of the workers. The result was an open-mindedness on both sides which soon resulted in a satisfactory adjustment. No formally-constituted works council could have rendered better service to both employer and employee than this improvised joint committee did. In fact, the beauty of the achievement is that it came into being spontaneously, not out of the solicitude or demand of the management or the men, but out of the awakened consciousness of the foremen. Their awakening had come through their study of the human factor in industry as presented in their group training.

Some months after this episode I attended a get-together dinner of the supervisory force of this plant. It marked the close of the training course, and several of the officials of the company, personnel experts, and educational specialists were there. Also there was a song leader present, a man who had had considerable experience in leading group singing in industrial plants during the war, and was now engaged in promoting this as a regular feature of personnel work. He sat next to me, and later in the evening directed the party in some stirring songs, but at the beginning I mistook him for one of the educational experts of the company.

"Oh, no," he answered with some emphasis, "I'm not mixed up with that line. These foreman's classes are just a fad, you know."

The song leader's attitude was fundamentally that of the executive who said, "What's the use of catering?" Whether he intended it or not, the suggestion was that the management had been spending its money rather unproductively in providing this educational work. And that is a characteristic attitude toward industrial education. It is regarded as a luxury, and of course when the ax begins to swing it is one of the first non-essentials to be cut out.

But is it a non-essential? And is it catering?

"We do not consider it so," said the personnel manager of a large Western industry. "Our educational program embraces a great many features—continuation schools for the younger employees, classes in English and civics for the large element of foreign laborers, technical training in the specialized branches of our work, foremen's classes, and courses in economics, modern languages, salesmanship, advertising, and commercial law. We have a personnel card on each of our employees, and by means of it are able to keep tabs on his progress. We have found that these educational courses do improve the working ability of the employees. I have in mind one foreman who increased the output of his department from 400 units per man to 700, and he has said that he expects to bring it up to 1000 per man. That is a direct gain in efficiency, in production; and it is by no means an isolated case.

"These gains are made not only through the teaching of actual methods, but an even more important element—to my mind—is the mental stimulus of the training. Take our foreman's course, for example. Our system of training there is

(*Continued on Page 45*)



A Branch Manager of a Nationally-Known Concern

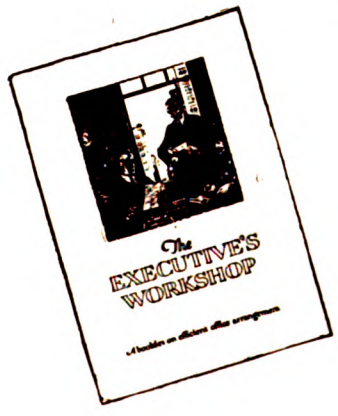
whose desk arrangement approaches the ideal of efficiency, uses the upper right-hand drawer for classified records of Sales Ideas, Employees' Records, Price Changes, Purchase Records, Cost Figures, Daily Tickler, Competitive Statistics, Departmental Reports, Advertising Records, Production Records.

In the lower left-hand drawer, he keeps a Data File, Personal Correspondence, Subject File, and Pending Matters. The lower right-hand drawer contains Progressive Sales Chart, Samples of Advertising, Telephone Book, and General Storage.

This is but one concrete illustration of how

The "Yawman and Erbe" Efficiency Desk

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is performing the functions of an additional secretary for thousands of executives—saving time and enabling them to work at higher speed with less strain.

Built in six distinct models, each with a variety of possible combinations in the way of drawer equipment, among them is exactly the right desk for YOU. An individual desk, designed and equipped so that every record, every document—and, of course, pencils, paper, and so on—is right where you can lay your hands on it instantly, without interrupting your train of thought.

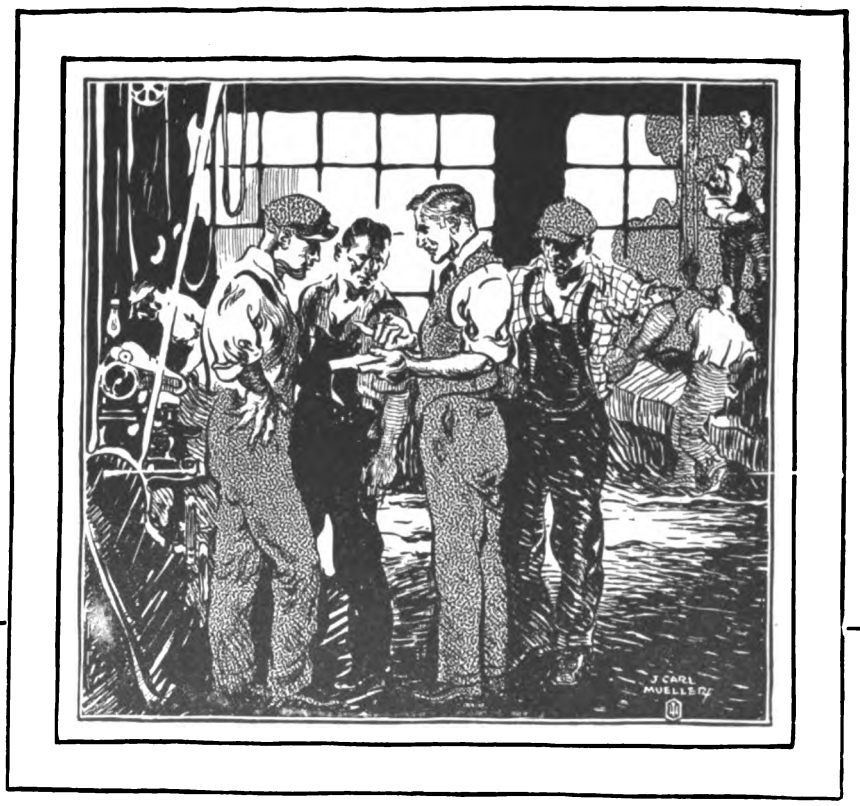
Irrespective of whether or not you need a desk, you will find the booklet "The Executive's Workshop" a veritable mine of information on planning the day's work, arranging the office equipment, and so on. Your copy will be sent on request, without cost or obligation.

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MODERN PRODUCTION METHODS

Why Have 450 Manufacturers Adopted This Plan Of Foreman Training?

In the fall of 1918 the first groups of foremen and other plant executives were formed to follow the training in Modern Pructcodutin oMethodsnd coed by the Business Training Corporation.

Since then the spread of this unique plan has been rapid and steady. More than 450 successful manufacturing companies, large and small, have adopted it. The Companies in which we have worked represent almost every line of industry—steel, textile, rubber, paper, leather, wood-working, machinery, agricultural implements, clothing, packing houses, railroads, coal mines, building construction, lumbering operations. Each industry has its special technique. But all industries have in common the basic problems of foremanship and of management.

These are successful plants. Their managers must be credited with good judgment. They think and investigate before they act. They do not spend money lightly without knowing what results can reasonably be expected. It is obviously their opinion that foremanship training ***pays;*** that it will help increase production efficiency, cut down costs, and add to their stability and profits.

If you are a director, president or other corporate official, manager or superintendent of a going plant in any line of industry, you owe it to yourself to ***get the facts*** about foreman training. It is not wise to lack full information as to a movement which has won such widespread approval and which may have such vital importance for you in assuring the success of your own plans for this period of business revival.

Within the last few weeks the following well-known companies, among others, have been added to the list:

Cambria Steel Company
Manning Paper Co.
Crown Cork & Seal Co.
Earl & Wilson
Austin Coal & Coke Co.
Heekin Can Company
Martin Parry Mfg. Co.

To get this information simply ask on your letterhead for our new booklet "STRAIGHT AHEAD FOR BETTER FOREMANSHIP," which carries the sub-title "A Record of Facts." A copy will be sent without any "strings" attached. Why not tear out the address below and get your letter in the mails today?

Business Training Corporation

"Greater Team Work Through Group Training."

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Send me without obligation the Special Report, "A Plan for Making Better Foremen."

*Name*_____

*Company*_____

*Address*_____

*Position*_____

*Number of Employees*_____

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(*Continued from Page 43*)

based on the belief that the foreman is the key in our industry, as indeed he is in all industry. He is the point of contact between the management and the men. If the foreman is rightly adjusted to the job, if he has a grasp of the basic principles of industry, knows something of the practical psychology of man management, and is alive to his dual responsibility to his men and to his plant, the chances are that production will come close to top notch in his department, with a minimum of labor trouble. Our training program aims to produce such foremen —and is doing it.

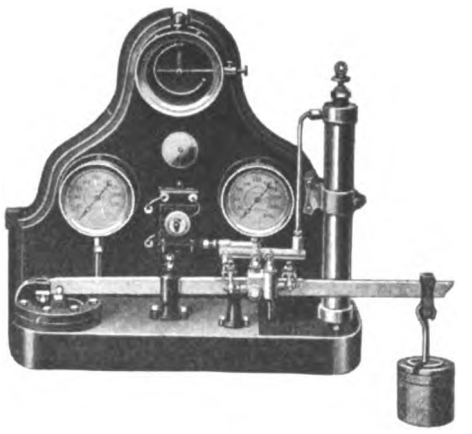
"Our training is designed to motivate the foremen — not merely to instruct them in mechanical methods and technique. In fact, the course does not go into the technical questions of our industry at all, but deals entirely with industrial fundamentals. It gives the foreman a comprehensive view of industry, its history, its rock-bottom principles, and their application to the handling of men, machinery and materials. These subjects are taught by text-books, by a weekly lecture and class discussions, and by a series of problems which each student is called on to solve individually. The problem solutions are graded, too, and keen competition has developed among the men in a group and between the various plant groups.

"When a man gets through the three months intensive training in these subjects he is more than a foreman. He is more than a supervisor and pace-setter for his department, though he is that also. If there are any of the traits of leadership in him, they have been discovered and quickened and developed. He is keyed for leadership of his men—and we have found few foremen of real ability who fail to respond favorably to this treatment. They become instructors and inspirers of their men. They carry over into their departments the spirit of their training, and each foreman becomes a little center for its propagation. Thus, through the foremen themselves, the ideas reach the rank and file."

In one plant the educational director emphasized the intangible results of the training. The employees had a greater pride in their work, a higher self-respect, and a keener sense of their responsibility in the factory's teamwork. There was a better fellowship among them. The case was cited of the foreman of a common-labor gang who was unable to read and write English; regardless of this handicap, he enrolled in the foremen's course. The remarkable thing is that he finished with flying colors, won a grade well above average, and got as much out of the training perhaps as any man in it. He was enabled to do this through the help of a fellow foreman who sacrificed an evening each week to read the text material of the course and the exercises, and to write down the answers as they were dictated. This was done, not once, but over a period of several months. Do you suppose that foreman will ever forget the unselfishness and practical helpfulness of his associate who served as his tutor? There is a friendship cemented for life, and the example of it has gone through the plant like a strong tonic.

The effect of industrial education, in some places, has been to relieve routine work of some of its monotony. Obviously the repetitious jobs cannot be abolished; they are necessary to modern production; but managers have learned that they can be made less depressing, and in some ways attractive. One of the means of accomplishing this result is to shift a worker about and not keep him steadily on one machine or process. This is not always feasible, however, for in some plants the work would suffer from such grasshopper tactics. Another way is to make the routine work interesting by showing the worker its importance, its place in the manufacturing process, and how it serves civilization. Some training departments make a special effort to give the workers this broad view of industry—to give them a sense of pride in their work through realization of its importance to the factory production as a whole. In many plants the bulletin board is used to post notices, charts, photographs and other illustrative material that connects up with this educational work. Pictures are shown of the far-away lands in which the fac-

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TODAY efficient managers are looking for, and installing such equipment, as will effect a definite net saving, pay for itself and pay a good dividend besides.

The McDonough Coal Saving System is the result of twenty-six years, experience in the manufacture and installation of fuel saving equipment in steam plants all over the country. It is offered on the basis of ***what it will save you*** over and above its cost of installation. No Saving, No Pay, and you simply turn part of the money that the Coal Dealer would get into a permanent plant improvement.

Experience with this Automatic System in scores of steam plants, has proved that it effects a ***minimum saving*** of ten percent in fuel; running from that minimum to as high as 25% saving.

We have an interesting proposition for either hand-fired or stoker-fired boiler plants. Write for the details, giving the size of your boilers, the price you pay per ton for coal, and the number of tons burned per year.

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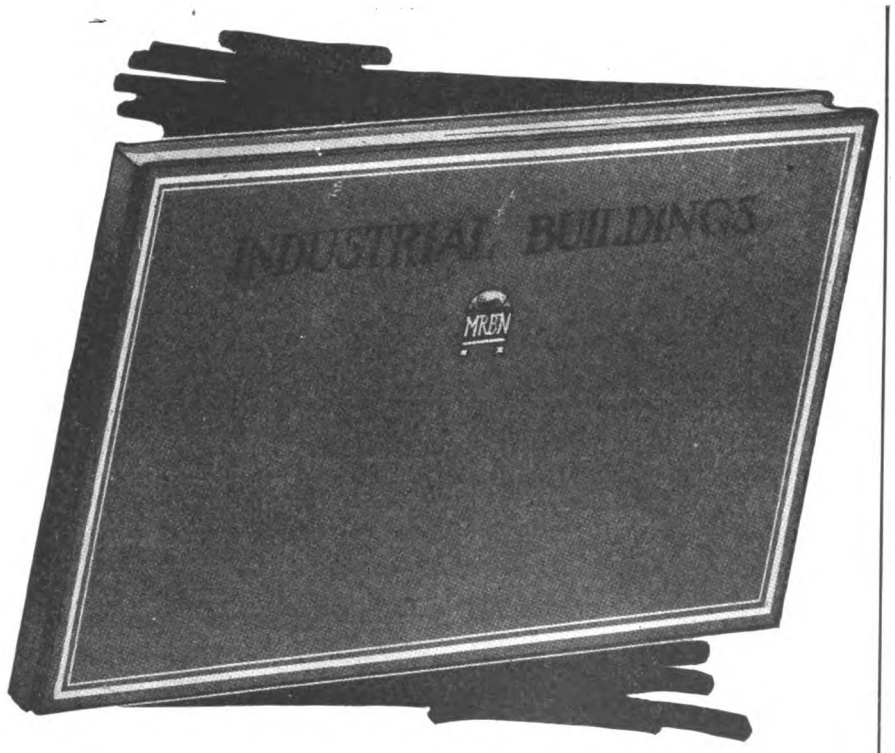
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That is practically what "*Industrial Buildings*" gives you, for it contains not only exterior and interior illustrations of twenty-five modern industrial plants, but floor plans, cross sections and plant layouts, as well as interesting facts about every one of the plants illustrated.

We are offering to send a copy of this booklet gratis to any factory owner or executive. No obligation.

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tory raw materials are procured, of the caravans, ships, and railroads that bring it, of the organization that makes and distributes it. Endorsements of the company's product are similarly posted for the information and stimulus of the employees. Some concerns make it a practice to post advance proofs of their advertisements on the factory bulletin boards. The practice of featuring in the company's advertising the workers' skill, loyalty, and other good qualities is familiar to all readers of modern magazine advertising. The appeal here is not only to the outside public—the customers and prospective customers—but also to the employees, the inside public whose goodwill many modern managers consider quite essential to successful operation and efficient production.

Dr. John R. Commons of the University of Wisconsin has pointed out that there are three theories of the employer-employee relation. There is first the commodity theory, in which the employer looks upon labor as a commodity to be bought as he buys his raw material and supplies. Then there is the machinery theory, which reckons labor not so much as a commodity, but as an instrument, something to be engineered to produce the greatest possible output. In fact, the employer in the latter instance is primarily an engineer who measures the value of his labor by its output; whereas the employer in the first case is primarily a purchasing agent, who measures the value of his labor by the prevailing market price. The third theory is the customer theory. It looks upon the employee as a customer, somebody who is buying a job from the employer, and who will be a contented, continuing, and profitable customer only so long as the bargain is a satisfactory one. Just as the business house must enjoy the goodwill of the public to be permanently successful, so must the employer enjoy the goodwill of his employees to be permanently successful.

It is the customer theory of labor that some managers scout when they ask, "What's the use of catering?" Their attitude apparently is that if industrial goodwill costs anything at all, it costs too much. Other employers hold that goodwill in an employee makes him more valuable as a commodity and also more productive as a machine.

"A contented worker, rightly placed in the right job, trained for it, and with the intelligent understanding of how industry is organized and what his part in its organization is, will cost less in labor turnover, spoilage, and idle time, will turn out more product, waste less supplies, and cost less in supervision, than the succession of floaters that are the usual grist where the hiring and firing and the breaking in of new men is left to the foremen, where modern personnel methods are conspicuous by their absence. And the final cost in the latter instance will be greater than that of the first." The foregoing quotation is from the manager of a mid-Western factory who has had experience under both systems.

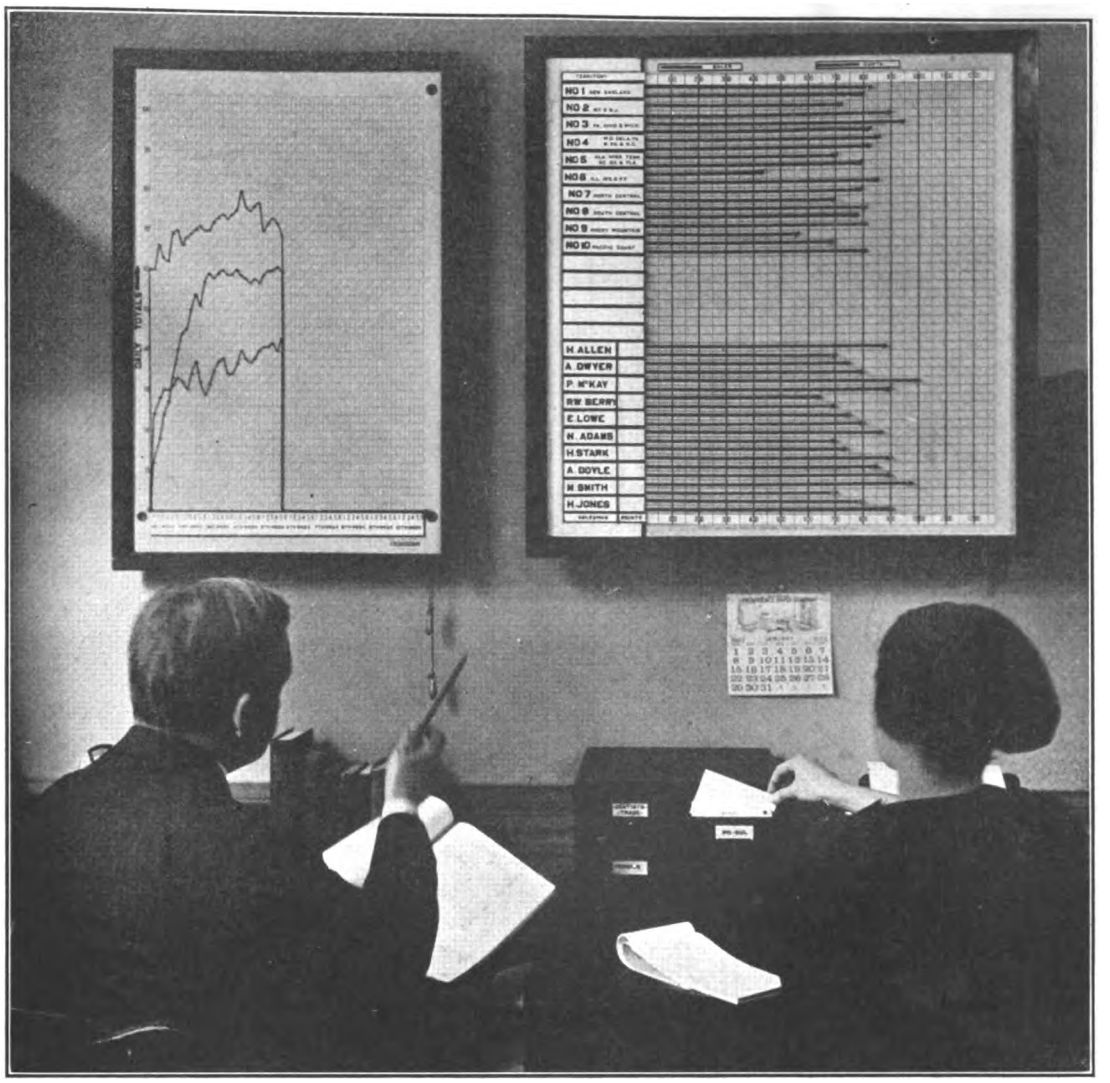
I asked this man—during the war his factory installed a system of employment management, including careful tests of applicants, job analysis, the fitting of men to jobs, foremen and employee training—I asked him recently what has been the total effect of this program. He answered:

"There has been a quickening of the initiative of the individual to improve the efficiency of his department without urging. Moreover, there has been a teamwork in the improvement. The improvement has been departmental. The foremen's training especially has been taken to heart. They are hardheaded fellows. They think concretely. So their natural tendency is to apply their training directly to their work. They have done what the principles taught naturally lead to, and the results are a finer teamwork, more efficient operation, improved morale, and a stronger organization."

What about the future? Is this program to be continued under the new conditions affecting labor?

"Why not? It was not adopted as an expedient. It is not a fad. And it has proved itself practical. Changes in the labor market do not affect what we are aiming for—which is, a steadily efficient work force animated by the right incentives, and producing profitable results."

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THIS MANAGER KNOWS WHERE HE STANDS

He keeps the facts before him on graphic charts.

EDEXCO MECHANICAL GRAPHS

make it easy to prepare even complicated facts in graphic form, in a very few minutes. These charts are large enough to be seen across the room. They are neat and clear-cut in appearance. They are not drawn on paper. Each bar is a ribbon whose length is altered at will.

In the picture above, the upper half of the EDEXCO Mechanical Bar Chart at the right shows the sales and quota of each territory so far this month. The lower half shows the same data for each saleman.

It only takes a few seconds to pull the tape out to the proper point each day.

This helps the sales manager and also stimulates the salesmen to their best effort, when they come in for their weekly conference. Some sales managers mail a photograph of such a chart to their salesmen in the field each week.

The chart at the left is the new EDEXCO CORD and PIN CHART. The chart is on a cork backing. A pin is inserted each day. Each cord is kept taut over the pins automatically by a separate weight. It is very simple to operate. This man is using it to show production, orders and deliveries.

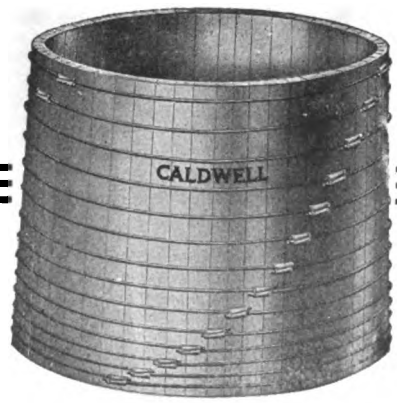
You might use these charts to show production facts or in some other way but you would still appreciate the value of the graphic method which saves you from making blunders or over-looking important facts. You cannot get these important facts singled out for you in a table of figures, and EDEXCO devices make chart drawing almost automatic.

Our four color booklet on "EDEXCO MECHANICAL GRAPHS" will be mailed promptly on request.

We also supply charting paper, map pins, swinging leaf fixtures, books on graphics and every type of graphic record supplies. Trial Outfit of small supplies for practice purposes sent for $1.00.

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With accurately machine-planed joints and rust-resisting iron hoops of correct size and spaced to insure a large factor of safety, a Caldwell Cypress Tank is virtually a solid piece of wood in rigidity and water-tightness

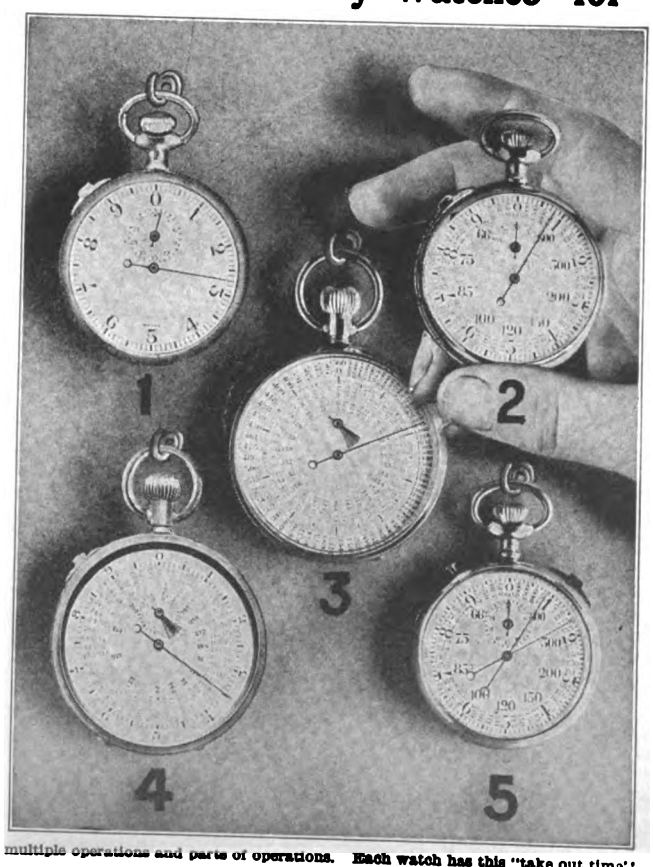
In addition to the long life of the cypress—the logical tank wood since it grows in water—Caldwell Tanks have the lasting qualities that can be built-in only by long-experienced tank builders.

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For Locating Wastes
Computing Costs
Setting Rates for Piece Work
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You can use any on of these watches foe every kind of time study. But each has special features that facilitate certain types of work. No. 1 has a plain decimal dial with the "take out time" feature. No. 2 has, in addition, direct readings in production per hour up to 1 minute jobs. No. 3 carries the same readings up to 5 minute jobs, in seconds and half-seconds. No. 4 gives all readings in decimals and shows production figures up to 3 minute jobs with a special arrangement for timing jobs up to 30 minutes. No. 5 is the "split hand" watch with the "take out time" improvement which now permits careful studies of multiple operations and parts of operations. Each watch has this "take out time" feature.

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Pick the watch that fits your job. We will gladly send it with a descriptive pamphlet on its use to any responsible concern on approval. Put it to any test you wish—prove its advantages in facilitating the work [illegible] necessary. Each watch is backed by our unlimited guarantee. Write us today [illegible] your requirements—or in case you desire our advice, tell us the class of work [illegible] Write today for detail-

[illegible] BERG CO.

Peoples C[illegible] Chicago, Illinois

An Industrial Disarmament Conference

(Continued from Page 22)

sense until the leaders get together and frankly and openly discuss and work out a plan. Likewise in the industrial world, leaders of employees and employers must have a common ground or point of contact, where they can come together and discuss the things of mutual interest to each other. What better plan has been evolved than through an organization such as is suggested here, which will allow and encourage them to work for each other's mutual happiness and contentment.

The thought must be eliminated from our consciousness that business is the principle thing in life, rather we must realize our ambition through happiness and contentment and through this channel our business will be bigger and better by reason of happy, contented employers and employees.

The very fact that this organization will promote the best there is in education, athletics, music and entertainment brings to all its members a wonderful opportunity to lay aside the humdrum of every work day, and, with each other develop the recreation or amusement in which they are most interested. This in itself will enlarge the vision of all the members and send them to their daily work in a happy constructive frame of mind, and above all through their accomplishment in their leisure time organization create more confidence in their own ability to do bigger and better things. This confidence in themselves will be reflected in their daily work.

This plan of organization can be adopted to a large industrial concern or can be the basis of a community organization in which all the industries and other business can be combined. Thus, it will provide the long felt need for a club house where employee groups can meet and discuss their future plans or ideals under proper supervision and environments. At present business men and executives have their clubs, but for some reason (probably for lack of leadership) the great mass of employees have no central meeting place for an exchange of ideas and profitable association.

It has been definitely proven that through association and personal contact in an organization of this kind the ambition of both employer and employee has to a very great extent been realized, which is a happy and contented industrial relationship which will be of mutual interest to both groups.

There does exist enough honest, square, just men in both the employer and employee groups to develop unsefish leadership that combined, will revolutionize and put on a sound operating basis all industrial and general business conditions.

The chart as outlined gives the complete plan for building an organization that will furnish a medium for employer and employee, either as an industrial unit or as individuals in a community to come together and work unselfishly for the mutual benefit of each other, socially, industrially and morally. A similar organization to this is now operating successfully in Cleveland. Its membership is recruited from industries and merchantile establishments as well as individuals.

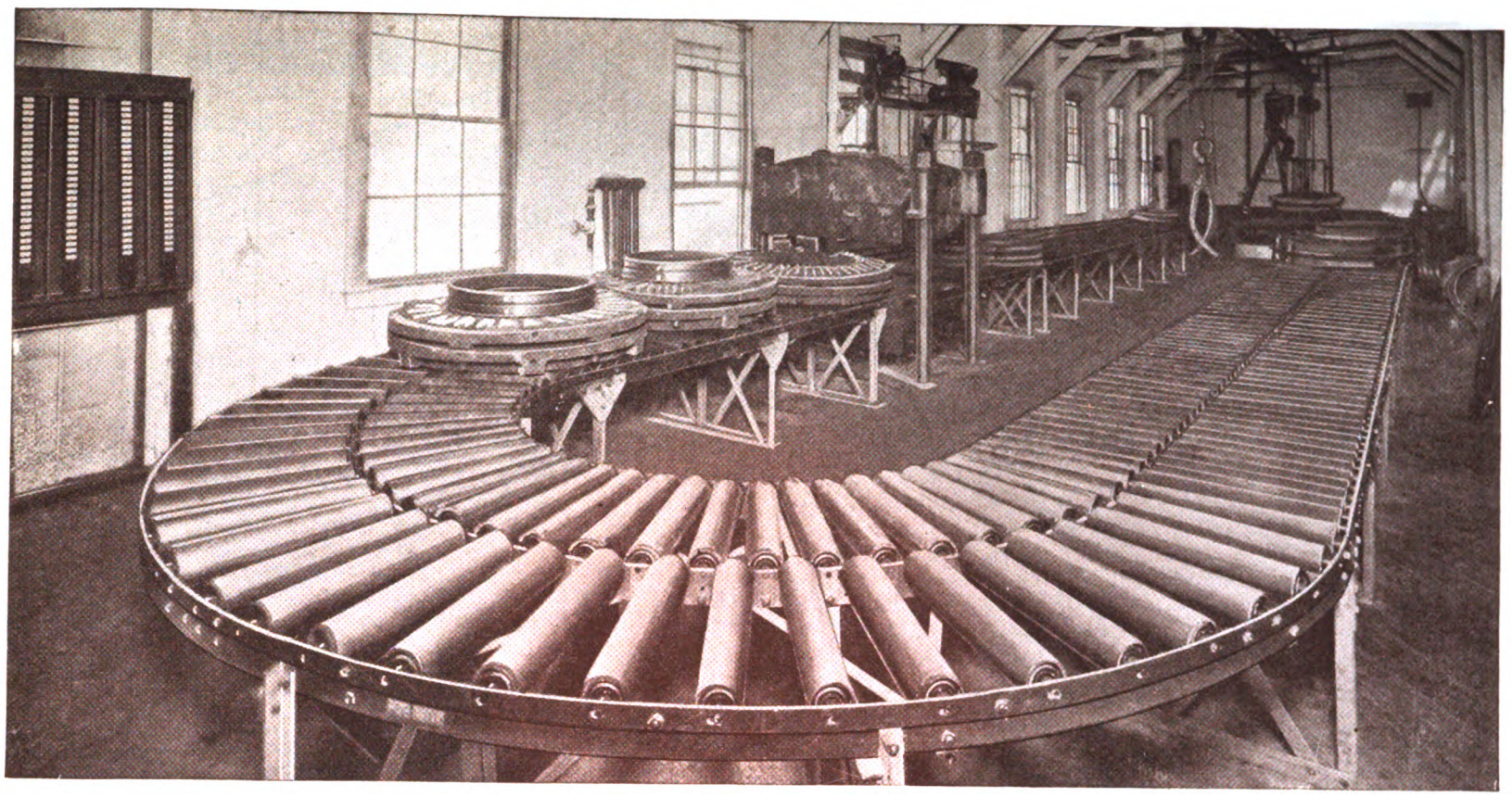
A great many of the larger concerns throughout the country have employee organizations. Very few employee organizations are producing the desired result due to the lack of coöperation on the part of employers, thus depriving the organization of the opportunity to express the coöperative inter-dependent spirit that is so essential between employer and employee.

Employees can never be organized successfully under any form of paternalism of employers. All the American employee desires is an opportunity to work with, not for, his employer, and this organization will provide an opportunity for both to come together and discuss the things that are of mutual benefit to each other.

In organizing an industrial association both employer and employee groups should elect their representatives to the Board of Directors from their own groups, each with equal representation on the Board. The directors will plan and

(Continued on Page 51)

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Make Material Handling Show a Profit Instead of a Loss!

Money Spent in Trucking wages is Gone Forever

Invested in Mathews Conveyors, it is conserved for years. Once installed, these tireless "laborers" do your trucking, gratis. Instead of paying out wages to them year after year, ***they*** pay ***you*** a handsome yearly profit.

Gravity Costs Nothing. Let it Carry Your Raw and finished Products.

$27,000 Saved
by a Western Tire Manufacturer

$12,000 Saved
by a Cooperage Company

$3,600 Saved
by a Mid-Western Foundry

$1,300 Saved
by an Eastern Wholesale House

$1,300 Saved
by a Philadelphia Wholesale Grocery

Why pay men to do internal trucking when gravity and conveyors will do it free? Why wear out floors, waste valuable floor space in wide aisles just to accommodate slow lumbering trucks? Why plan costly building extension, when Mathews Conveyors, narrow, compact and suspended from ceilings, will give you the necessary room for present growth?

Our Free Engineering Service

The first and Most Necessary Step in Solving Conveying Problems

Purchasing Mathews Conveyors is not like purchasing most factory equipment. A great deal of engineering work is involved. Before we will sell or even recommend a conveyer, one of our Conveying Engineers must first determine what type of equipment is needed. If necessary, he will also design, a special system, without cost or obligation.

These precautions are necessary to prevent the customer from specifying the wrong type of equipment. Due to this conservative policy, we are able and willing to assume responsibility for whatever we recommend.

If you have a problem involving conveying, ask to have our nearest engineer call. Write today for illustrated catalog, showing numerous installations.

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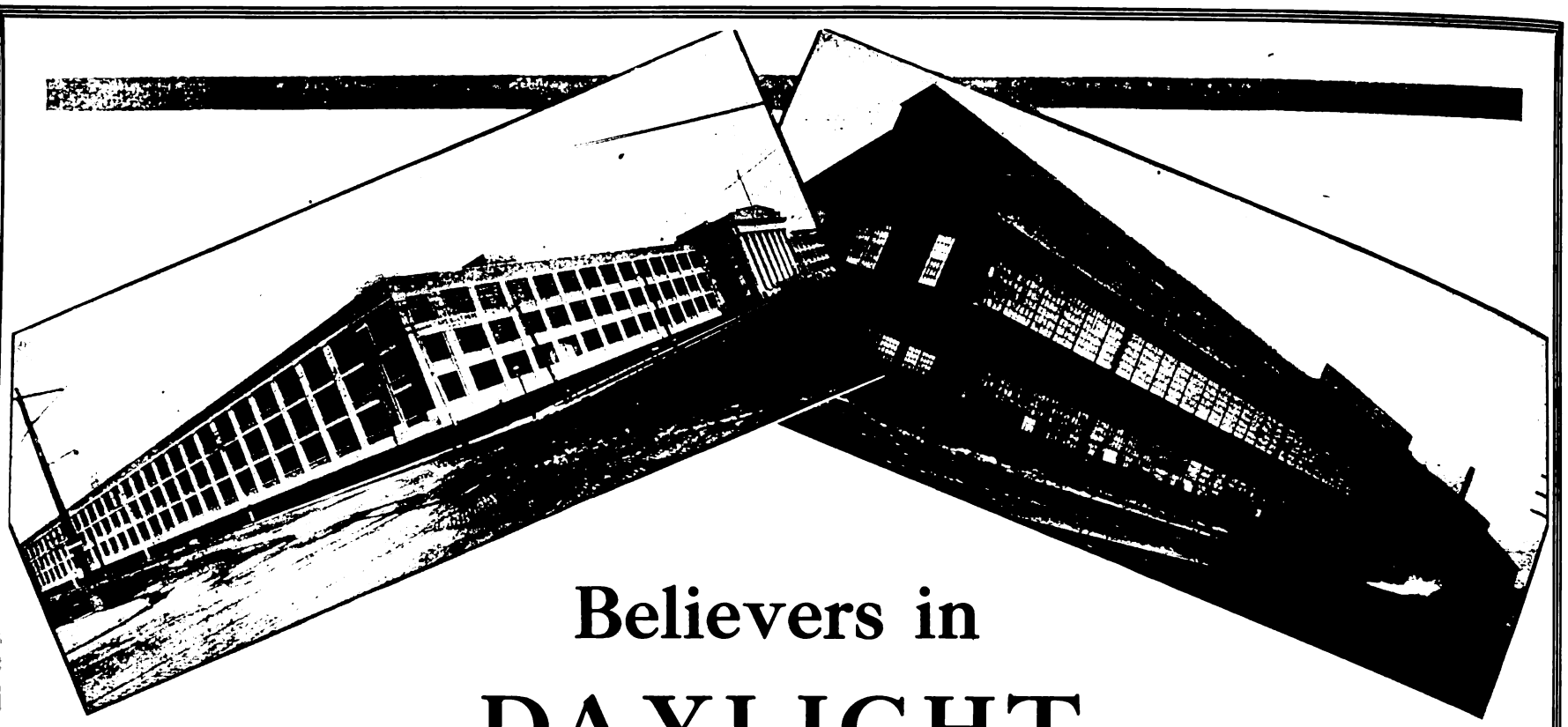
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SPEED ECONOMY
GRAVITY ROLLER CONVEYER

We manufacture all types of conveyors for handling Tote Cases, Packages Castings, Lumber and Raw Materials.

Ball Bearing Roller Conveyers
Ball Bearing Roller Spirals
Spiral and Straight Clutes
Belt Conveyers
Steel and Wood Pallet & Conveyers
Automatic Straight Lift and Inclined Elevators.

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These are a few of the many structures that make efficient use of daylight, while at the same time minimizing fire risks. There are many types and designs of Mississippi Products.....among them, the one that suits YOUR needs.

Ask for catalog and sample of glass suitable for use as a Paperweight

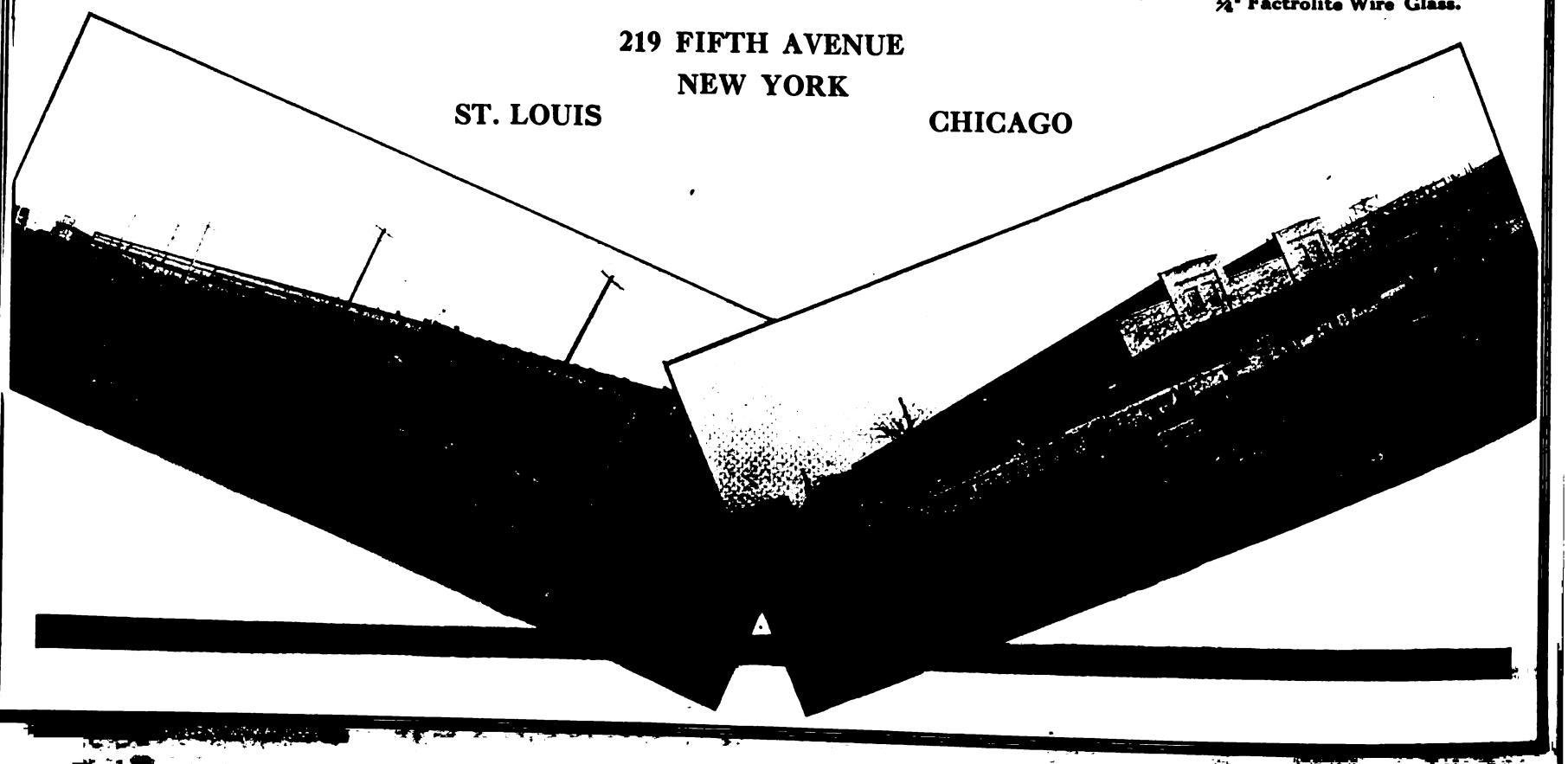
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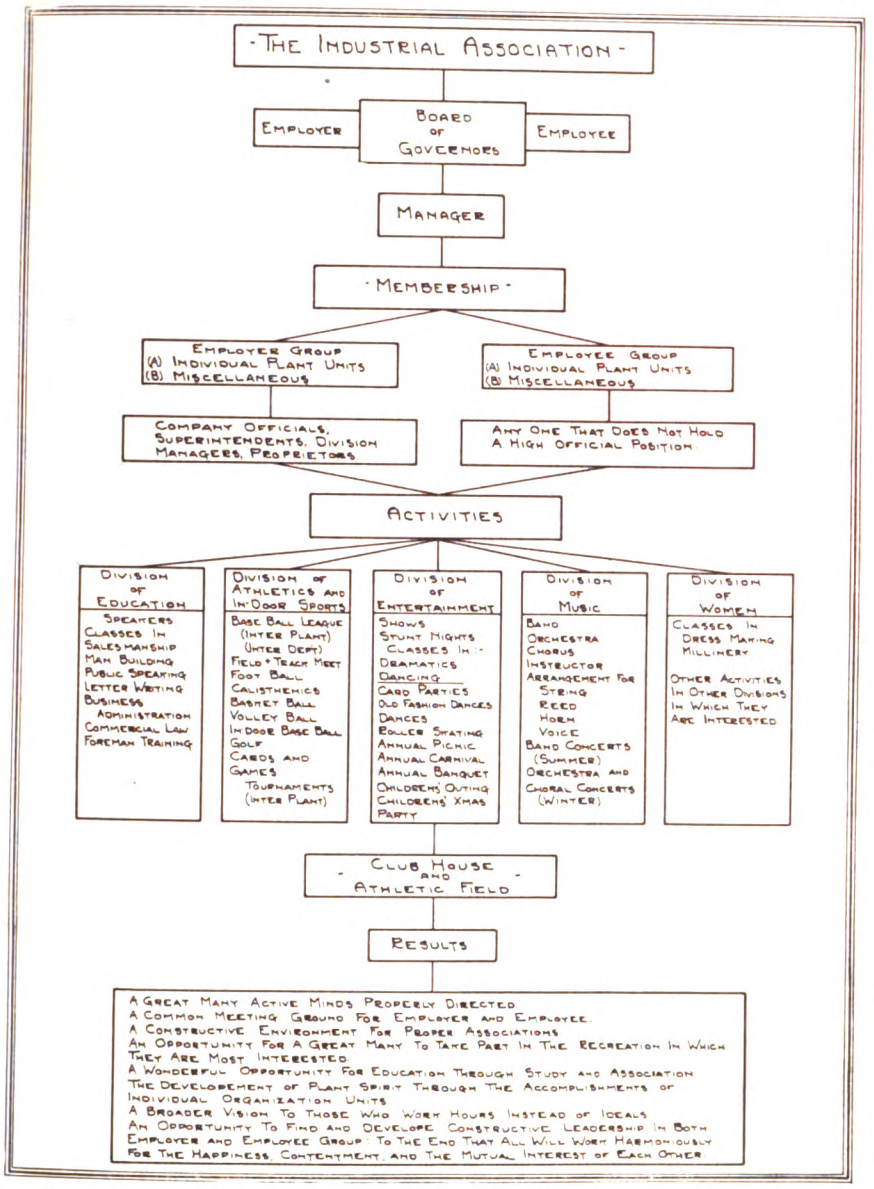
(Continued from Page 48)

direct the activities of the organization subject to the general approval of the membership. If it seems desirable a manager should be employed to carry out the plans and policies. At the head of each division should be an experienced man who is capable to develop these activities on a bigger and better scale that is ordinarily done. He should devote his entire time to his particular activity. The progress of each division will be the inducement for membership in the organization. In a community organization individual concerns should hold the identity of their organization in the different activities as far as it is possible. Thus, the Ideal Mfg. Company group would have a baseball team in the league, or a group from this concern would furnish a program, of their field and track team would compete in the big field meet, ectra, thereby, creating a plant spirit to their own concern which would be expressed through the Industrial Association for the benefit of the entire membership.

The membership of such an organization as a community organization should not be less than 3000 members in an ordinary community, and should exceed the 15,000 mark in the larger centers. The dues should be nominal so as not to exclude the person who probably would receive the most benefit.

In order to operate to the best advantage and serve one of the greatest needs a large well appointed club house located as near the center of the city as possible should be secured, and as the membership and interest in the organization grows the necessary expansion should be made to adequately provide operating facilities.

There is nothing impossible to a right idea, and if both employer and employee will develop this suggested idea along unselfish lines there can be developed in each community or in the larger industrial concerns an organization that will demonstrate the real value of unselfish service for each other. This will be reflected in a harmonious, happy and contented people. Will eliminate the ghost of distrust and suspicion between employer, employee and will place business on a sound, prosperous foundation.





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THE present exchange situation offers exceptional opportunities for American concerns of all kinds. We have exported from and imported into the United States tens of thousands of tons of raw products and finished goods. We are equipped by experience and fully organized to attend to all the details of your foreign trade requirements, including the financing of same. Our connections with leading banks in all important European countries enables us to attend to remittances in all exchanges and to the cashing of coupons. We are in a position to advise you, both on the market for exports and on the materials and products which can be imported to advantage.

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Public Opinion and the Price of Coal

(Continued from Page 23)

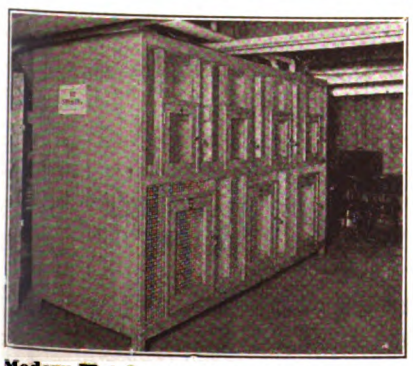
helpless in such a situation as fuel, but with the increased production of the war, this is not so much a deciding factor as it was, and so, You, Dear Public, who are asking yourselves this question, are the only ones who can answer it, and it is by Your future attitude that the situation will be determined.

To predict what public opinion would be, is only to say that in the end it will be what is only absolutely right, fair and just, and the quicker the situation of industrial depression reaches the climax, depends upon the speed that public opinion is crystallized.

The National Association of Purchasing Agents is glad at all times of the opportunity of presenting what it considers an only fair and impartial attitude on such matters. It is but a drop, but by such drops are oceans formed, as well as oceans of public opinion, and this overwhelming wave might just as easily and as quickly overtake any angle of the fuel situation, one way or another, as it did all industries last fall.

We do not think there can be much resumption until the freight rates on fuel and the price to the ultimate consumer is more stabilized, and on such a par that the increased consumption and correspondingly increased production will further bring it to new levels, in line with the other commodities of today, and only at such time can we expect much relief.

When this time will come is a question, but it will not be before every interested party comes before the bar of public opinion, shorn of all camouflage, with clean hands and a quicker return to the Golden Rule.



Modern Hotels even have Dog Kennels.

How Loyalty is Inspired by Ideals and Leadership

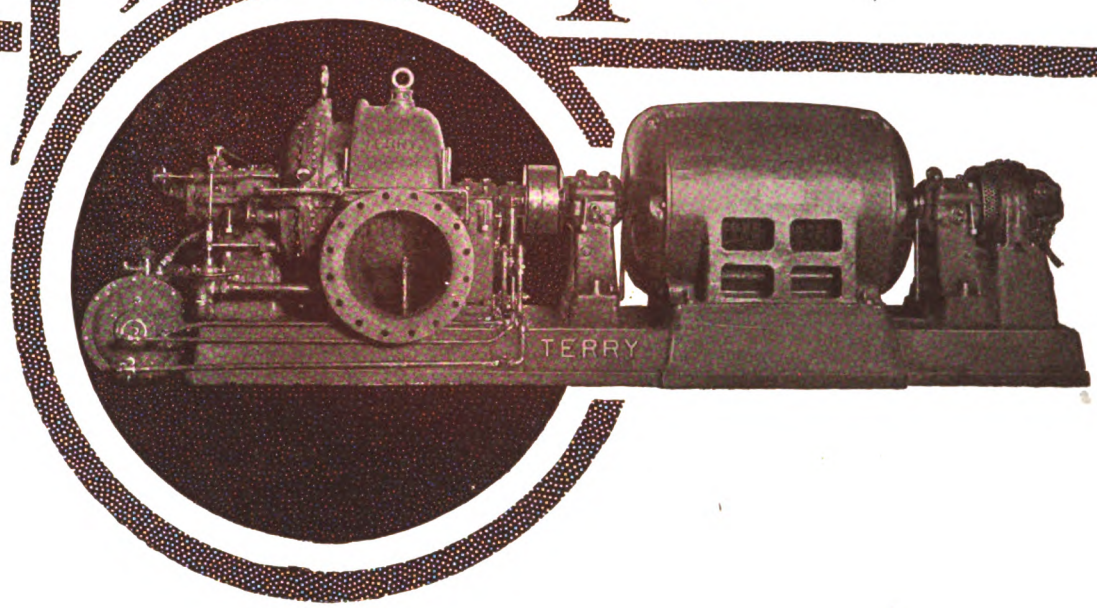
(Continued from Page 22)

It is necessary first to find the facts and make sure of them, then to publish and prove them. Unless the workers and the public know and believe that the present day manufacturing costs of iron and steel products are on a much higher basis than they were in 1914, confidence will be lost. When confidence goes, loyalty is crumbling.

capable leadership which they

I believe that the spirit of loyalty grows and develops in an industrial organization which has an ideal worthy of accomplishment, if an intelligent group of men and women who understand the purpose of their work have sound and capable leadership which they can trust.

THRIFT



PRESENT day economy entails a more careful utilization of heat and power. With the existing engineering knowledge and skill available, wasting of national resources is deplorable. Plants or industrial concerns requiring both heat and power should so balance their operating practice that both may be obtained with the lowest possible coal consumption.

The design of the Terry condensing line of turbines, including high and low pressure, mixed pressure and bleeder types, is adaptable to an infinite variety of heat and power conditions. They can efficiently utilize the energy remaining in the exhaust steam from steam hammers or other steam operated equipment; they can furnish steam at any desired pressure after having first extracted the available energy down to that pressure; and at the same time maintain a power load which may be independent of the variable steam requirements. They can also increase the capacity of existing non-condensing plants at least 65% without increasing the coal consumption.

A word from you and the Terry engineer in your vicinity will be pleased to show you how well the Terry can meet your heat and power requirements.

T-733-a

THE TERRY TURBINE



Offices in Principal Cities in U.S.A. also in Important Industrial Foreign Countries

The Terry Steam Turbine Co.
Terry Sq. Hartford, Conn. U.S.A.

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Modern Methods in Automobile Frame Assembly

(*Continued from Page 21*)

so unusual at the present time, as to offer a number of points of interest, which may later become common practice.

The principal features of the installation may be listed as follows:

The general layout of the assembly, riveting, and inspection stands, into three units that make up one assembly section.

The electric rivet heaters with their tracks, trucks and trolleys.

The electric reamers with their method of attachment and various applications.

The overhead construction, carrying air and electricity.

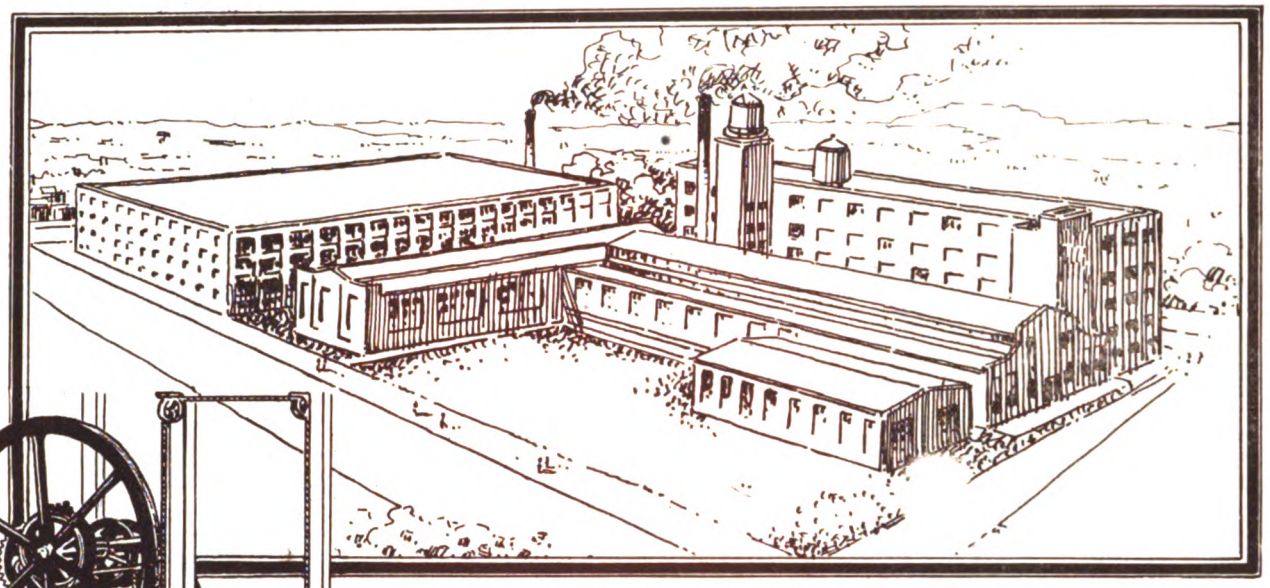
The conveyor track circling the section, with its carriers and chain slings.

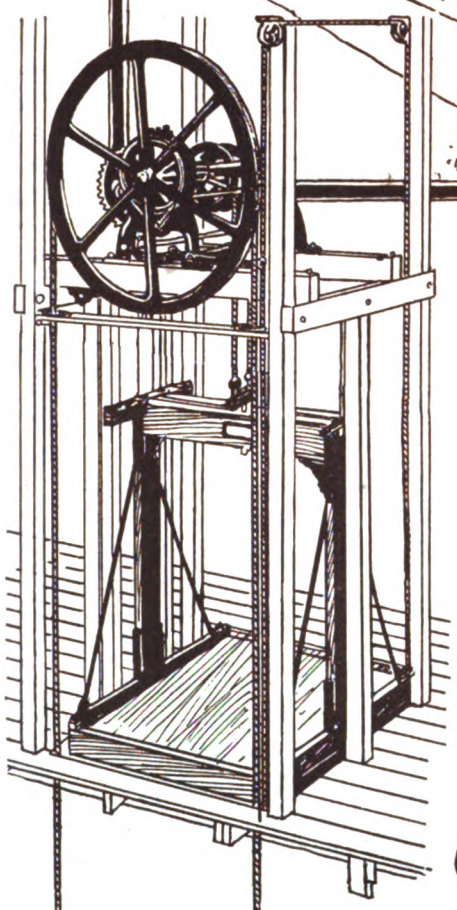
The paint tanks and their application.

The overhead construction, which may be seen in any of the views, consists in heavy I-beams, secured in concrete at the two ends of the section, and carrying steel cables. These cables are supported, partly through tension, and partly by smaller I-beams that divide the section into its three parts. The smaller beams are not secured to the cable, but have sheaves at their tops, over which the cable passes. The air lines are suspended from these cables and run down along the sides of the large I-beams at each end of the section, where they are fitted with shut-off valves, and attached to the air headers. The headers run through trenches at both ends of the section at the foot of the large beams. The overhead lines are fitted with tees at the proper intervals, that terminate in special air cocks and detachable air couplings. The cocks are so constructed that they take up their own wear and so remain tight indefinitely. They also exhaust any air remaining in the hose lines as soon as they are turned off, a distinct advantage.

The conveyor track, which unfortunately, is only partly shown, completely circles the section and passes over the inspection stands, a storage space ahead of the painting, the paint stands, and the unloading stands. Carriers, to handle some thirty frames, travel on this track. Each carrier is fitted with a chain, one end of which is made fast to a swivel below the carrier, and the other ending in a ring that may be hung from a hook on the same swivel. This construction is best shown in figure three. The chain is of such length, that when the frame to be loaded is standing on its edge on the inspection stand, it will just pass around the frame and allow the hook and ring to be engaged. When one of the carriers is so attached at each end the frame is simply rotated or allowed to drop, till it lies in a horizontal position. It will then be up and clear of the stand and hanging in the chains, with several inches between it and the stand. The reason for this is that the alti-

(*Continued on Page 57*)





SEDGWICK SERVICE IS INDIVIDUAL SERVICE

Sedgwick outfits are more than merely Dumb Waiters, Hand Power Elevators, or Gravity Lifts—they are vertical conveyors designed to meet the individual problems of the manufacturing plants in which they are installed.

Sedgwick outfits do not necessarily supplant power elevators, but they always supplement them and increase their efficiency. Power elevators for raising heavy loads—but use Sedgwick Gravity Lifts where the heavy load comes on the down trip, or Sedgwick Hand Power Elevators or Dumb Waiters when it's a question of raising or lowering lighter loads.

Included in the list of users of Sedgwick Equipment are many of the best known manufacturing establishments in the United States. Ask any of the concerns in the list below what they think of Sedgwick outfits and the quality of service rendered. Tell us your requirements and let us send bulletins and descriptive literature.

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Dumb Waiters and Hand Power Elevators
140 West 15th Street, New York, N. Y.

SEDGWICK

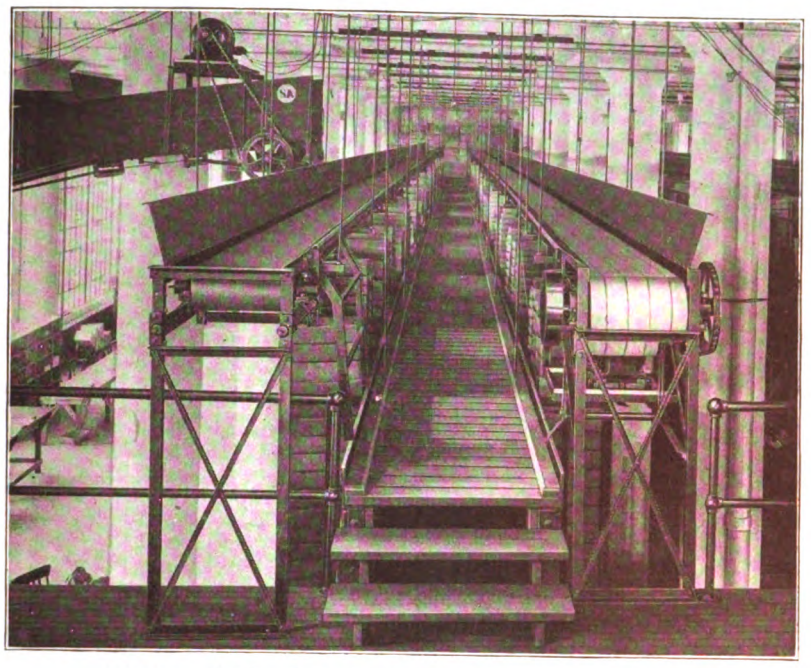
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American Blower Co.
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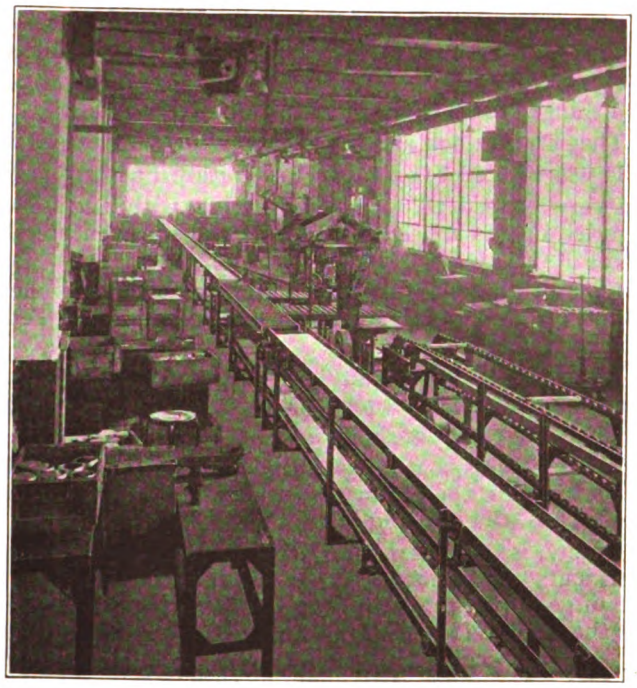
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SURPRISE YOU---INDEED



National Cloak & Suit Company installation



American Can Company installation

it will surprise you to know what it has actually cost you to handle your materials in the past year. To get just an idea of the money which is being wasted through lax methods of handling materials in your plant go into each department starting in the receiving and finishing in the shipping. Make notations of the methods used, amount of time consumed to carry articles to and from given points and draw your own conclusions as to why your handling costs are high.

Conveying Systems Solve Handling Problems

We will gladly make an analysis of your handling problem and submit design of a conveying system particularly adapted to your individual conditions which if installed will reduce your costs, increase efficiency of your organization and enhance your production.

Resolve immediately that your 1922 handling costs will be substantially reduced and to get action communicate with us immediately.

SAMUEL OLSON & COMPANY

2418-26 Bloomingdale Ave
CHICAGO ILLINOIS

5th Ave. Bldg.
NEW YORK CITY, N. Y.

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Ted Carpenter, Works Manager, Was Up Against It, Good and Hard

THE FACTORY PLANT over whose destinies he presided was reputed to be a triumph in engineering skill.

His men were as loyal and capable a bunch as were ever gotten together under a saw-tooth roof—but

SOMETHING WAS RADICALLY WRONG

It was difficult to maintain production schedules.
Fatigue was rampant throughout the works.
Losses from spoilage were enormous.

His men met with accidents at every whip-stitch—the ambulance gong was almost as familiar a sound as the factory whistle.

In vain were all his postings of rules and impositions of fines—the place was untidy and littered up, among men, mind you, who wouldn't let a cigar ash fall in the wrong place at home.

His workers were constantly complaining. Some days they had to leave their machines to go to the window to see how correct their work was. On other days, it was the glare that drove them frantic—or to their oculists.

WHAT WAS THE MATTER?

Ted had spent many a weary hour, and tossed many a sleepless night, and tramped many an inspection trip up and down the plant, and consulted many an expert—to get at the seat of the trouble.

Nothing doing.

Things went from bad to worse.

Not only did his plant have a disease, but it was an ailment that defied all the plant doctors to diagnose what it was.



JUST AS TED was getting to the desperation point and beginning to think of scanning the "Help Wanted" ads,

SOMETHING HAPPENED

The January issue of INDUSTRY ILLUSTRATED came to hand.

(Was there ever a plant where it did come to hand in which things didn't begin to spruce up a tidy bit?)

That crackerjack article on pages 28, 59 and 60 did the trick.

It was headed "Light as a Production Factor."

Every blessed thing that was wrong with Ted's plant was categoried in this article among the things preventable by THE RIGHT KIND OF LIGHT.

Each of the five illustrations pictured a kink in plant lighting that Ted, and all of Ted's researches, and all of Ted's men, had never hit upon.

Immediately, the paint brushes got busy. Lights were shifted. Lattice shades were installed. And so on. And so on.

That was three weeks ago.

Ted writes us that already the difference is marvelous—in the eye troubles, the production schedules, the fatigue, the ambulance calls, the dirt and all.

Funny, isn't it, how the NEW WAY of showing where plant betterments can be made—a handful of trenchant words and a brace of good pictures, featuring the high spots—will accomplish more than a five foot shelf of handbooks, in pointing out where costs can be cut, production speeded up, waste eliminated, workers made more contented?

When you come to think of it, it is not so strange, after all. It is human nature—the same kind of human nature that makes Will Hays' new job worth $150,000 a year to him. People go to movies, and they revel in the pictorial sections of their daily papers and they devour their INDUSTRY ILLUSTRATED—*because they are built that way.* There is not an educational institution in the world today that hasn't its lantern slides. The Camera is the greatest educator—the picture is the one thing that speaks the universal language—INDUSTRY ILLUSTRATED, the Camera-plus paper, is helping more men and is going into more plants *every day.*

Is it coming regularly to you or to your plant?

If not use the coupon at left.

The Engineering Magazine Company,
120 West 32nd Street, New York.

Put me down among the Ted Carpenters of modern Industry—the men who are ever on the lookout for new ideas that will make their jobs bigger and help them to grow with their jobs. Keep me there for at least twelve months—as a subscriber to INDUSTRY ILLUSTRATED. I shall remit the subscription price on receipt of your bill—some time within the next 30 days.

Name .....

Mailing Address .....

Company ..... Position .....

Annual Subscription Price, $1. In Canada, $1.25; Foreign, $1.50.

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(Continued from Page 54)

tude of the triangle, formed by the frame on edge and the chain, is considerably greater than that formed by the frame and chain, when the frame is horizontal, due to the difference between the height and width of the frame. With this construction, one man can readily turn a two hundred pound frame completely over as it rests in the slings, an operation that is necessary at the painting stands.

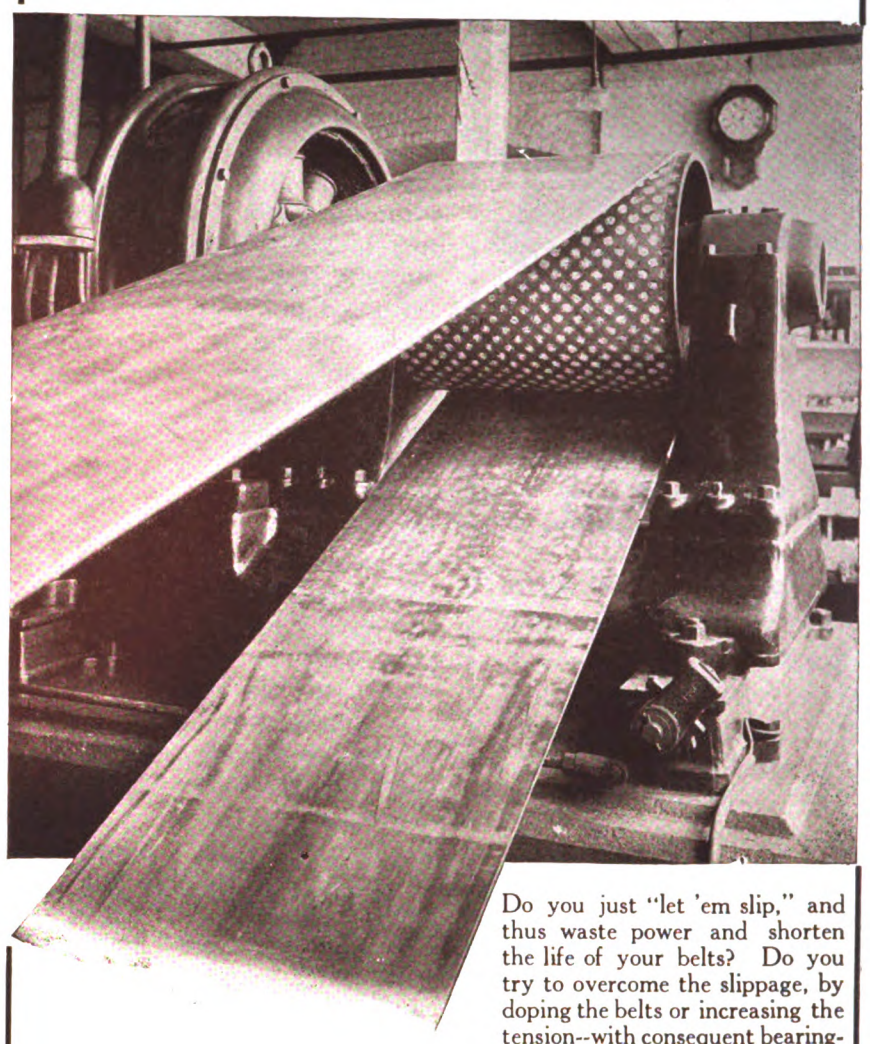
The paint stands, of which there are two, may be located in a general way by referring to figure one. In this view, the second of the two stands, or tanks, is directly behind the second building column from the right, and under the conveyor track, along which the frames travel from right to left. A space, somewhat longer than a frame, and to the right of this tank, separates it from the first tank, a corner of which shows beyond the first column on the right. Beyond the fourth column from the right is the unloading stand, with a frame ready to be removed from the track to a truck. Seven men handle the conveying, painting and unloading of all frames produced in the section. One works the track ahead of the painters, keeping the painters supplied, and the frames cleared away from the inspection stands. Two painters work at each paint stand, brush painting the frames, and two do the unloading and keep the inspection stands supplied with empty carriers. At the first paint stand, that part of the frame facing up, together with the sides, are painted. The frame is then passed along the track to the space between the stands where the men turn it over in the slings so the parts not painted are facing up. The two men at the next stand then complete the painting and pass the frame to the unloading stand. The paint tanks are of such a height from the floor as to just clear the frame passing over them. They are a little longer, and somewhat wider than the frame itself, and are surrounded by a platform that brings the men to the proper height to get at their work most easily. A section through, and across one of the tanks would take the shape of a shallow letter W, being about five feet across, by eight inches deep. Some three inches of paint is kept in the two troughs thus formed, for the length of the frame. In painting, the same motion, necessary to get paint on the brush, is continued to wipe the brush on the frame. The excess paint, instead of being wiped from the brush before applying, drips back from the frame into the trough, as the brush is passed back over it a second time. This doing away with the extra motions, makes it possible to get the required speed, with the few men and still not sacrifice quality.

The unloading stands do not require any detailed description as they are duplicates of the inspection stand, and the operation of unloading is the exact reverse of the loading. One stand is used for each different make of frame being run simultaneously, the two unloaders covering them all.

In each unit there are five riveting gangs, composed of three men each, the riveter, the bucker-up, and the heater; one assembling gang of two men; one reamer gang of two men; one finishing gang of two men; making with the inspector a total of twenty-two men.

The process starts with the assembling gang, setting up the parts in one of the assembling stands, and reaming the holes, if necessary. They then repeat their operations in the other assembling stand while the first riveting gang drives a predetermined number of rivets, at points to hold the parts together. The riveters then move to the other assembling stand, while the assemblers remove the first frame to the adjacent first riveting stand, or to the place provided on the floor, if that stand is occupied, and then assemble another set of parts, as before. The operation of this assembling gang, and the riveting gang, is so timed that they can keep in very close step with each other. One riveting gang works on each of the next two stands, with one man from the reamer gang covering both. They drive the rivets in the top flange, and that part of the web that can be reached without turning the frame over. They start at one corner and work completely around to the starting point. When either gang is finished, they put the frame on the floor in the space pro-

What do Slipping Belts Cost You?



Do you just "let 'em slip," and thus waste power and shorten the life of your belts? Do you try to overcome the slippage, by doping the belts or increasing the tension--with consequent bearing-strain and frequent belt breakage?

Cork Insert Pulleys

do away with makeshifts and give the belt a chance to *deliver full power without slip and at normal tension.* Their demonstrated saving in fuel (or in electric current consumption) is a factor you cannot afford to ignore in the present necessity for cutting your cost to a minimum.

Every CORK INSERT PULLEY is guaranteed to give satisfaction in the service for which it is designed.

As a step in your cost-cutting campaign, fill in the coupon below.

THE CORK INSERT CO.

168 Federal Street — Boston, Mass.

The Cork Insert Co.,
168 Federal Street, Boston, Mass.

Gentlemen:—
Please send me immediately full information on

☐ Cork Insert Pulley ☐ List of Users

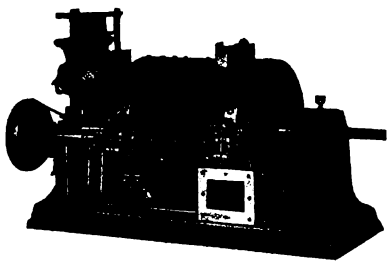
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Pulverized Coal



The Aero Unit System

of Pulverized Coal again demonstrates, as in other work of human endeavor, how an original idea at first worked out by complicated and costly methods is finally simplified and perfected until it becomes a part of our every day existence.

The Unit System reduces the equipment and therefore the cost to a minimum by placing the Aero Pulverizer at the furnace where the coal is fed to the machine undried and is exhausted therefrom directly into the furnace. There are no dryers, no storage or long lines of transportation for the powdered coal, thus eliminating the hazard of fire or explosion.

Each Aero Pulverizer is designed as a complete powdered fuel unit for one furnace. They are built in standard sizes ranging from 600 lbs. to 5000 lbs. of coal per hour.

Bulletin Sent on Request

AERO PULVERIZER COMPANY

165 Broadway New York

vided beyond their stand, and in an inverted position, or on the adjacent final riveting stand, if it is open. Here the same operation is repeated on the lower flange and the balance of the web. Separate fittings, that may have to be riveted to the frame and that can not be placed in the assembling, are put on at either the first or final riveting stands, depending on the number of rivets, the first or second riveting gangs have to drive. For any make of frame, the division of rivets is previously determined upon, so that all the gangs may keep in close step with each other. It can be seen that the riveting gang that works the two assembling stands will set up about the same number in two frames that each of the other four gangs set in one, as that gang covers two stands. The finishing gang and the inspector go over the frames supplied to them from the two final riveting stands, to make any final touches necessary, and to see that all rivets are properly driven. It is an easy matter for the inspector to determine the gang responsible for defective work, due to the division of rivets, and any frame containing such rivets is immediately carried back to that gang by the finishers. Such an occurrence will of course disrupt the progress of the entire unit, the delinquent gang incurring the displeasure of all the others, as the unit's pay depends on the total number of rivets that are driven in that unit. The net result is that very seldom does a frame have to go back. The inspector, incidentally, is paid independently of the unit's production. When a frame is accepted the finishers attach it to two of the carriers on the overhead track and clear it away from their stand to make room for the next one. The man from the painting gang who works the track ahead of the painters then takes it to the first paint stand together with those that may be coming off the other units. Here the four painters go through their operations as previously described and pass it to the proper unloading stand. The two unloaders remove it from the slings and put it on a shop truck. When the shop truck is piled with the one make of frames to its capacity, it is pushed away to storage for twenty-four hours so the paint will be dry before shipping, and an empty truck placed at the unloading stand.

To give an example of the possibilities of the unit installation, the results of a recent run are here given:

One unit run—9 hours
Frames produced—270
Rivets per frame, smallest ¼", largest ⅜"—59
Number of different lengths, ¾" to 3½"—6
Number of heaters—5
Number of riveter gangs—5
Total number of men not counting inspector in unit—21
Total rivets driven—15,930
Total rivets, per day, per gang, or per heater—3,186
Total rivets, per hour, per gang, or per heater—354
Estimated time, heating, sticking, driving, hours—6.3
Percent of total time—70
Estimated time, shifting, fitting, reaming, hours—2.7
Percent of total time—30
Number of continuous rivets possible per hour, per gang—500.

Since the experience of this company with electric rivet heaters has extended over a period only a little in excess of one year, and since the limit of rivet diameters has only been up to one half inch, there may be some one who would question its possibilities in larger sizes and over work involving more difficult conditions. The writer is therefore fortunate in having available another set of production figures, made recently by a company that uses the electric rivet heater exclusively in the manufacture of railroad cars of all kinds, and drives rivets that average much larger than those required for an automobile frame. The heaters used in the particular case cited were of course of greater capacity and had five heating points. The heater did not stick the rivets he heated as the nature of the work made this unfeasible. Machines were used for the most part to drive the rivets instead of the ordinary air hammer.

Example of actual run on standard railroad hopper cars.

Duration of run—9 hours
Cars produced—24
Rivets per car, smallest ⅝", largest ⅞"—1,179

(Continued on Page 60)

***The* J. G. WHITE MANAGEMENT CORPORATION**

MANUFACTURING, FINANCIAL AND *MANAGEMENT PROBLEMS*

New York

INVESTIGATIONS and REPORTS ON *BUSINESS CONDITIONS*

43 Exchange Place

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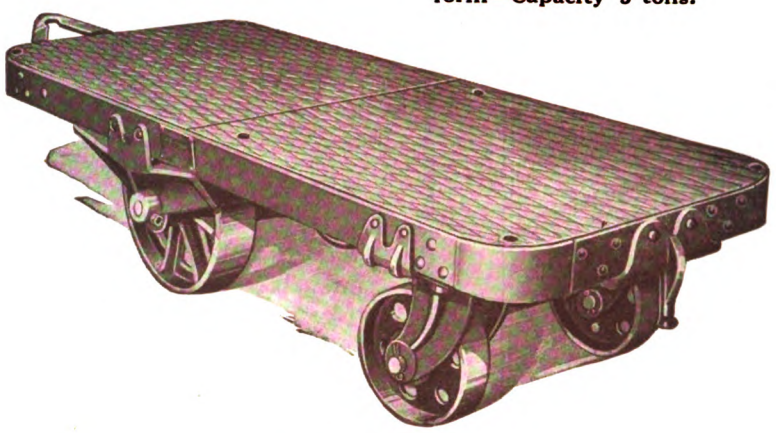


Many classes of industrial wheeled equipment are made by the K. & J. organization

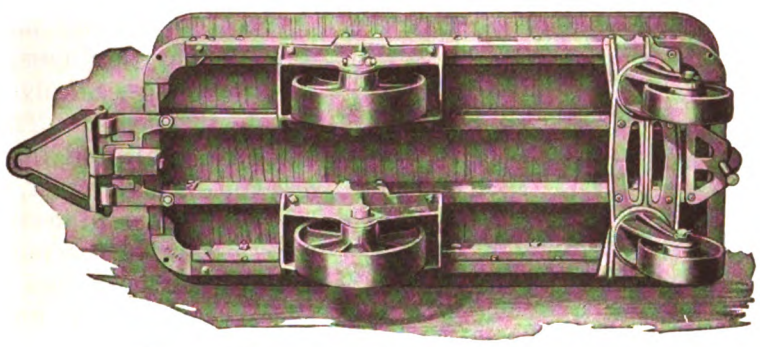
"K. & J." Railess Car Equipment

For Storage Battery Tractor Systems

"K. & J." Industrial Trailers, Fig. 419 with Steel Plate Platform—Capacity 3 tons.



Using, with a tractor, trucks primarily designed for man propulsion is in most cases an expensive and wasteful practice.



Inverted View, 418—with wooden plat form
Fig. 418 is the same as Fig. 419 except platform construction

Trailers shown above are of the "K. & J." Standard Heavy Service Type for foundries and all metal and clay working industries; also for the heavier warehouse, freight house and dock service.

This type is supplied with either removable steel plate platform. or with wooden platform.
Also supplied with semi-automatic coupler or with common Y coupling, as ordered.

Rear wheels roller bearing. Roller bearing castor stem turning in vertical rolling bearings. Castor swivel ring bearing.

Frame dimensions 72x30x16¾ high. Approximate weights, with wood platform, 725 pounds, with steel platform, 750 pounds.

We also supply standard trailers in one and two ton capacities. If your requirements necessarily are for a special type of trailer we are prepared to design and build these in quantity very economically.

A well designed trailer is little brother to the freight car. It must be designed to handle tonnages rather than hundredweight.

Good trailer equipment must withstand the stresses formerly encountered only in small car service plus runway impacts of a much more severe character.

The greater tractive effort ordinarily required to move "non-railed" trailer equipment must be reduced by proper running gear design.

The thrusts and impacts to running gear incident to handling heavier loads must be well provided against by trailer design.

Good tracking of trailers, one with the other and with the tractors, must be afforded if trailers are to be speedily and easily handled on curves and safely handled on narrow loading platforms.

Adequate beam for the support of heavy loads under all conditions and rigid, rack-resisting frame connections must be embodied.

Quick, easily operated coupling attachments must be devised and supplied.

All of these points and more are fully taken care of in "K. & J." Trailer Equipment.

For further information write for our Bulletin

HYATT ROLLER BEARINGS INCLUDED IN STANDARD EQUIPMENT

The Kilbourne & Jacobs Mfg. Co.

Columbus, Ohio, U. S. A.

New York, 120 Broadway



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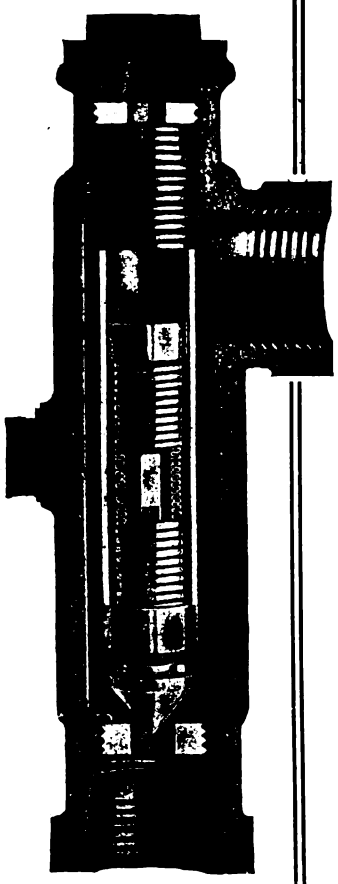
A True Steam Trap— Not A Hot Water Collector

The object of a steam trap is to save steam.

One glance at some steam traps of the "bucket" or "float" type shows how poorly they fulfill their mission. They are simply receptacles for water that has dropped below the steam point and waste instead of conserving steam.

Our first thought, in designing the Steam Trap Sarco, was to build a device that would *save* steam as *rapidly as it collected.*

The Sarco does its work with an absolute minimum loss of steam. There is no chance for the condensate to collect and cool. The automatic operation of a sensative expansion element opens and closes a valve, releasing the hot condensate the minute it collects. This conservation of heat units represents a very substantial annual saving, even on steam lines of moderate size.



The Sarco saves money in other ways also. It doesn't waste steam by leakage. It doesn't require constant repairs. It can be installed quickly on any steam line without resorting to expensive construction work. And it costs only one-third as much as a "bucket" type trap.

For all-round economy, the Sarco every time. You don't have to buy it on chance, either. Our thirty-day free trial offer gives you the option of putting it to the test at our expense.

Write today for Booklet R-6.

SARCO CO., INC.
233 Broadway, New York
Ellicott Square, Buffalo
Monadnock Blk., Chicago
1145 Griswold St., Detroit
Drexel Bldg., Philadelphia
7016 Euclid Ave., Cleveland

Steam Trap
SARCO

(Continued from Page 58)

Number of different lengths, 1¼" to 4"—12

Number of heaters, ⅞" capacity, five point—10

Number of riveter gangs—10

Total number of men, including heater boys—51

Total rivets driven—28,296

Total rivets, per day, per gang, or per heater—2,830

Total rivets, per hour, per gang, or per heater—314

Actual time, heating, sticking, driving, hours—5.58

Percent of total time—62

Actual time, shifting, fitting, reaming, hours—3.42

Percent of total time—38

Number of continuous rivets possible, per hour, per gang—505.

The experience of this company in the comparison of heating costs between oil and electricity is also interesting. In 1914, 1915, 1916, with oil at three and one-half cents and electricity at one and one-quarter cents, electric heating showed a saving of $1.29 per hundred pounds of rivets heated. In 1917, 1918, the saving came to $2.37 per hundred pounds, with oil at five and one-half cents and electricity at one and one-quarter cents. In 1919 oil cost eleven cents and electricity one and one-third cents, and the saving came to $4.84 per hundred pounds.

Of any of the features of the installation, the heater is probably the most radical departure from present-day practice. The operation itself is widely different from that employed with the usual gas or oil fired furnace. In the latter, the heater shovels a number of different size rivets into the furnace, heats them all, and then takes them as he desires. This inevitably results in a large percent of overheated or burned rivets. Oil or gas is being consumed, whether one or a dozen rivets are being heated, and often runs without any at all. The oil or gas furnace has to be started and brought up to heat before production can commence. The heat given off makes it necessary that it be placed at a distance from the men. This means, of course, that rivets either have to be thrown to a sticker, or out onto the floor, a number at a time, with the result that many of them will be too cold to be driven properly. Even those that are driven directly on being removed from the furnace, may be too cold in the center, particularly if they have been forced to heat in a very hot fire, as an oil or gas furnace heats from the outside in.

On the other hand, with the electric heater, the heaters attention can be centered of the few rivets being heated at any one time, so that spoilage is reduced to a negligible amount as against the five to fifteen per-cent for the oil or gas furnace. Current is consumed only when a rivet is actually being heated, and the machine will operate just as fast, immediately after the whistle blows, as it will at any other time. There is practically no heat given off so the heater can be brought up to and used right at the point of demand. The rivet next desired, is heated in less than two seconds and from the inside out. The result is that it will by no chance have a black core, if the outside has any color at all, and it will stay hot longer, and will drive faster and better.

There is but one important requirement that must be observed, to successfully operate the electric heater. The rivets must be clean and fairly free of scale, or heavy rust, in order to obtain instant contact. If care is take in the purchasing and storing no further action is necessary. Under any other conditions it is necessary to in some way clean them before using. To this end a small tumbling barrel was installed, and run by the stock-keeper in charge of rivets and supplies. By operating it a short time each day, no difficulty is experienced in keeping a large supply ahead of the demand. There is no additional expense in connection with this operation, aside from the negligible amount of current used.

The following tabulation of the savings effected by the complete installation, makes a very fit conclusion to the description of its features and operation:

BY GENERAL LAYOUT:

Capacity in the number of frames doubled, with the same number of men on the same floor area.

BY OVERHEAD CONSTRUCTION:

A saving of one hundred and twenty feet of hose out of the three hundred and seventy-five

(Continued on Page 63)

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Decreasing Costs When Production is Limited

The problem of decreasing costs in face of limited production is simplified and often times solved by getting production facts.

Our business is gathering, organizing, and interpreting facts—devising systems and methods —counseling on operating and financial procedure.

We invite the opportunity to explain our services

H. M. WEBSTER & COMPANY

New York, N. Y.
25 West 43rd Street

Albany, N. Y.
82 State Street

Washington, D. C.
Southern Building

Certified Public Accountants
Production Engineers
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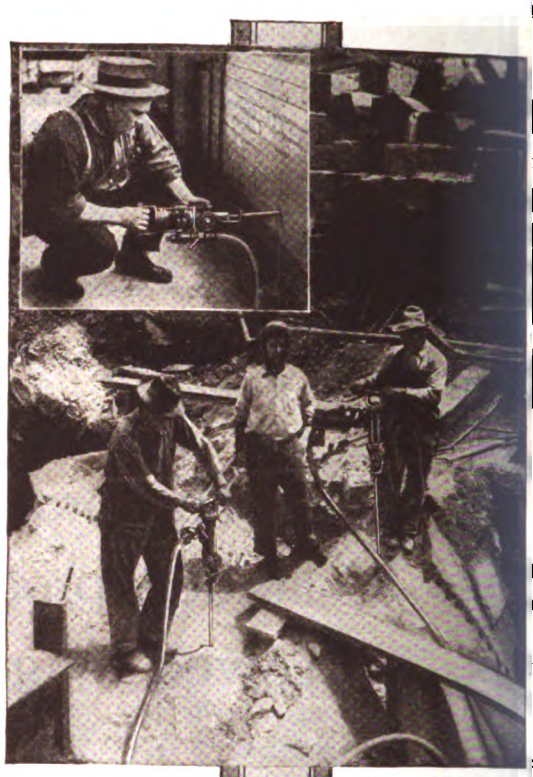
Audits, Examinations, Tax Service
Surveys, Cost & Accounting Systems
Business Organization
Operating Efficiency
Bank Audits and Systems

Executive Offices
25 West 43rd Street

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Ingersoll-Rand

WHERE CAN WE USE MORE AIR?



EVERY day men are asking this question because they know that the use of more air means less manual labor and reduced production costs.

AIR OPERATED tools such as riveters, grinders, rock drills, etc., have ideally demonstrated their superiority, power and flexibility.

AIR chucking devices have materially increased the capacity of manv machine tools and special appliances.

ADVANTAGES of cleaning with the air jet and painting with the paint spray were instantly recognized and adopted.

THE AGITATION and transportation of liquids with compressed air is being used wherever possible.

SO THE "STORY OF AIR AND ITS USES" grows ever bigger for each day men see the advantages of its application and every day the compressor which supplies the air assumes greater importance.

MEN who know specify "Ingersoll-Rand" and where only a limited supply is needed they choose the Class "ER" belt driven compressor shown below. Its simplicity appeals to the operating engineer, and its efficient performance is revealed in each month's power bill.



Consult our engineers for suggestions about the use of air and let us send you descriptive bulletins. Bulletin 3330 describes the "ER" compressor in detail. If you are interested in steam drive request Bulletin 3131 describing Class "FR" machines.

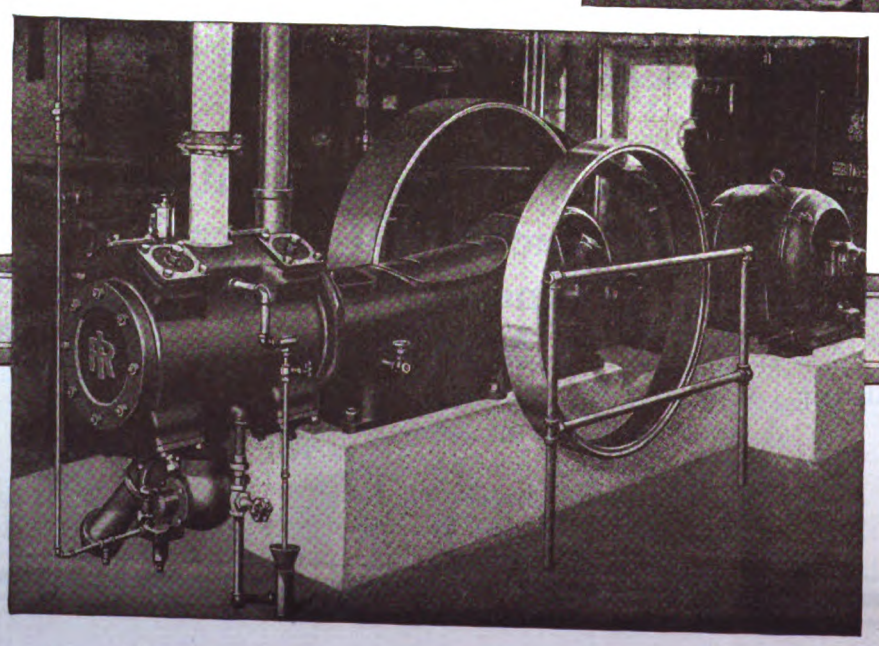
Ingersoll-Rand Co., 11 Broadway, New York
165 Q. Victoria St., London, E. C. 4

Joplin, Butte, Juneau, Duluth, Dallas, Houghton, Cleveland, Pittsburgh, Birmingham, Los Angeles, Detroit, Denver, Boston, El Paso, New York, Knoxville, Scranton, Seattle, St. Louis, Chicago, New Orleans, San Francisco, Salt Lake City, Philadelphia

Offices the World Over

596-6







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(Continued from Page 60)

eet formerly necessary when he lines were on the floor, and reduction from three quarter nch armored to one half inch lain hose, distributed over the ection and applying to the air ammers only.

A saving of nine months per ear on the life of the two hun- red and fifty-five feet of air ammer hose in the section.

A saving of sixty valves and ouplings in a year, by having hem off the ground where they annot be run over or knocked oose.

A saving of one man on main- enance, who formerly had to e in constant attendance.

BY ELECTRIC RIVET HEATERS:

A saving in burnd rivets, of he total driven, about ten per- cent.

A saving of one dollar for fuel, on each one hundred pounds of rivets heated.

A saving of one half hour per unit, per day, in waiting for the heat to be right.

A saving of two men on maintenance, who formerly had to be in constant attendance. A year of operation has developed no maintenance expense whatever on the fifteen heatrs.

A saving due to the elimination of the danger attendant on flying rivets, flashing furnaces, broken oil lines, and exploding tanks.

BY ELECTRIC REAMERS:

A saving in the difference in cost between three hundred and seventy-five feet of three-quarter inch armored hose, and two hundred and seventy feet of two conductor electric cord in scrap hose.

A saving of nine months per year on the life of the electric cord in the scrap hose.

A saving due to the shutdown of a four hundred foot air compressor, formerly required for the old air reamers. This saving is not appreciably reduced by the current required for the electric reamers as an excess from a motor-generator set, that serves a magnet crane is used. Had the current to be purchased its cost would very closely approximate one-seventh of that required to generate and use the compressed air to obtain the same results.

A saving in maintenance on the eighteen reamers, of forty-nine hours per week out of a former fifty of one man's time. This hour is used each week in oiling, and cleaning if necessary. The repairs on these reamers, in over a year of service, has amounted to a half dozen minor switch parts, and one end plate. The latter was broken through using the reamer as a hammer, to knock cross members into place in the assembling stand.

BY CONVEYOR TRACK, CARRIERS, AND PAINT STANDS.

A saving of an extra shift of eight men, and one man on the regular shift, not taking into account the lost time to production, due to the former congestion of frames, that could not be gotten out of the way during the shift. The gang seven men, that work the track and paint and unload can handle well over eight hundred frames in nine hours.

A saving of fifty gallons of paint per hundred frames, by brush painting over a tank, instead of spray painting, as was formerly done. This is due in part to the painter using an excess of paint in his spray, but mostly, to the relatively small target offered by the frame parts, as compared to the width of the spray area. Since the action of the air in atomizing the paint, made it of inferior quality, it could not be retrieved, except in a small percentage to the fresh paint used.

BY THE SPECIAL AIR COCKS.

A saving of the former estimated air leakage through the old style valve, of ten feet of air, per valve, per hour.

A saving by the elimination of all maintenance.

A saving due to the elimination of blown out gaskets in the coupling, when disconnecting the air hose. This is made impossible of happening in the air cock used due to its construction that immediately exhausts all air remaining in the hose as soon as it is turned off.

IN GENERAL.

A saving, that cannot be overestimated, in having conditions to work under that are orderly, clean, and pleasant, to always conform to the Company's slogan:

"More Than A Place To Work"

You Can Do It Yourself-

Compute Time Studies- Set Piece Work Rates- Find Accurate Costs- Locate Waste Motion

NOW there's no need of calling in outside experts for these jobs. You yourself, whether you are chief executive, production manager, engineer, superintendent or foreman, can now make any kind of time study of your own work, whether it's locating wastes or setting rates for piece work or bonus system.

You can take our plant management and time study course—formulas—detailed directions—explanations—right into the shop—use them with your time study watch—and know definitely how to get results.

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Trained time study engineers have collected these methods thru years of research in almost every industry. And now they have reduced them to practical terms—for use right in the plant by factory trained men.

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Write Us Today for Details

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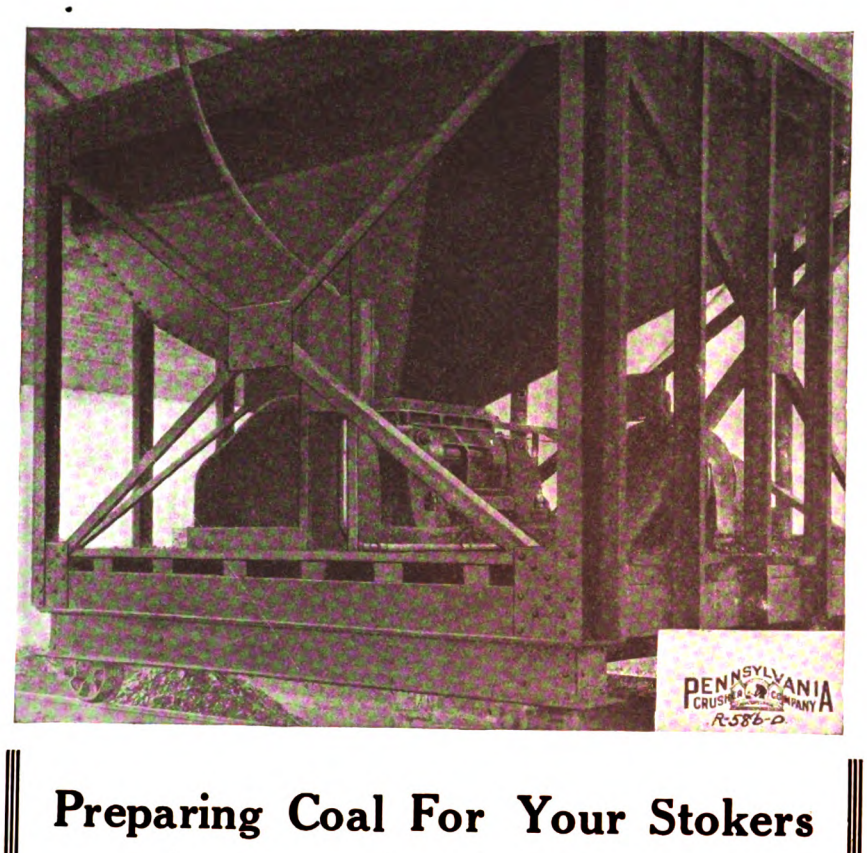
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"PENNSYLVANIA"

Single Roll Coal Crusher



Preparing Coal For Your Stokers

ORDINARY bituminous coal at destination can be readily handled without imposing serious work on the Crusher, and in the past many installations have been made on this basis with the Crusher as an obscure part of the general coal handling equipment.

Due to the fact that many different kinds of coal must be handled in times of shortage, serious trouble has often resulted, especially when crushing heavy block coal, and when large tramp iron was encountered.

For these reasons, increasing attention has been given to the design of coal Crushers both by manufactures and engineers, to insure satisfactory service when handling heavy block coal and in spite of the miscellaneous tramp iron which collects enroute from mine to stokers.

THIS SERVICE DEMANDS INTELLIGENT DESIGN, MASSIVE CONSTRUCTION AND THOROUGHLY ADEQUATE TRAMP IRON PROTECTION.

The New Series of "Pennsylvania" Single Roll Coal Crushers incorporates these necessary features and insures the uninterrupted preparation of uniform stoker fuel from heavy R. O. M. Coal

Eight sizes, with capacities ranging from 20 to 300 tons per hour.

Our Engineers will be glad to co-operate in suggesting a way to install a "Pennsylvania" Single Roll Coal Crusher in your coal handling system.

Your copy of Bulletin 1001 awaits mailing instructions.

PUT YOUR COAL PREPARATION PROBLEMS UP TO US

PENNSYLVANIA CRUSHER COMPANY

Stephen Girard Building

23 South 12th Street, Philadelphia

New York **Pittsburgh**

The Consumer—Partner in Electric Utilities

(*Continued from Page 15*)

bond or mortgage money will be safeguarded so conservatively that it will be obtainable in sufficient amounts, combined with the proceeds of sales of stock to consumer—partners, to provide for the construction as rapidly as the market can consume the power."

When the sale of stock to consumers of electrical corporations was first inaugurated some few years ago, we found that consumers were purchasing stock so that the dividends would pay their light and power bills. In Southern California the light bill of the average bungalow owner is $24.00 a year. The dividend on three shares of stock paying 8% on par would therefore equal the annual light bill. Closer analysis showed that merchants with larger light bills were purchasing on substantially the same basis; that ranchers who used large quantities of power for irrigation were purchasing stock so that the dividends would pay for their pumping; and so on, to the big manufacturers and iron mills.

For every $100 expended in new construction, only $60 or $65 is secured from bonds; the remaining $35 or $40 must be secured from the sale of stock. In this way, we have been financing the construction in ten counties of Southern and Central California, which contemplates an expenditure of almost a quarter of a billion dollars, and the development of about a million and a quarter horsepower from the streams of the High Sierras.

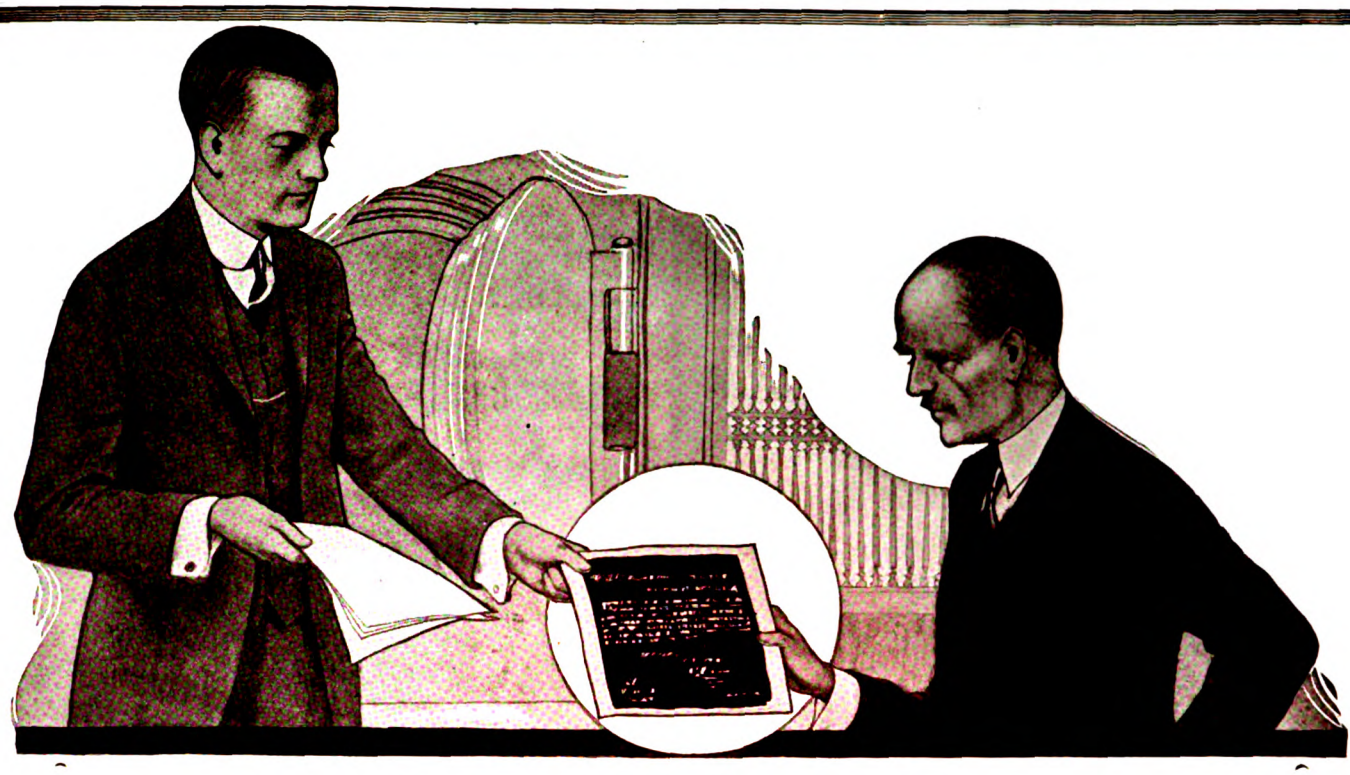
To develop the potential energy of the Colorado River, and place it at the disposal of the six million inhabitants of the seven states and portions of states within the Colorado River Basin, requires simply the extension of the same principle upon which we are developing the streams of our California mountains, and serving a million people in the ten counties of Southern and Central California. Six million inhabitants of the Colorado Basin States would represent about 1,000,000 consumers.

The logical unit of development for the river, in terms of horsepower, would be about 200,000, and while the figures are as yet very tentative, it has been estimated that the development would cost about $150 per horsepower. The construction would proceed at the rate of not to exceed $30,000,000 or $40,000,000 per annum, and each unit would probably take from two to three years to construct. The development of the whole river, however, would probably be spread over a period of from 20 to 30 years, depending upon the rapidity with which the territory possible to be served, should develop and make a market for the power. Judging by the effect of cheap and abundant power in the territory served by the Southern California Edison Company, the great part of which was originally semi-arid, it is entirely possible that the period of 20 to 30 years for the development of the territory tributary to the Colorado River may be considerably shortened.

The development would automatically carry with it, the equation of the stream and the impounding of water for irrigation. This would mean the elimination of dread disaster from floods, and the putting of the water to constructive uses, irrigating the desert lands and bringing prosperity, population, and community wealth to vast territories now waste and barren.

The company has submitted its application to the Federal Government under the recently enacted Water Power Act. This act provides that a license would be granted for a period of fifty years, at the end of which time the Government would have the option of taking over the property and paying for the net investment. In the meantime, the company would be regulated as to construction plans, issuance of securities, and rates for electricity, by the State and Federal Governments. Under the stimulus of private initiative and enterprise,—a company owned and operated by its consumers, regulated by the Government,—the greatest speed and economy is assured without friction, and with equitable distribution of power to consumers and municipalities without discrimination, at the maximum of efficiency, and the lowest rates.

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The PHOTOSTAT also saves many hours in the advertising department, where it is used to reduce illustrations to finished size, to copy layouts, and to determine whether light or dark backgrounds are the more effective. (The orginial subject can be reproduced either with the same or with reversed black and white values.)

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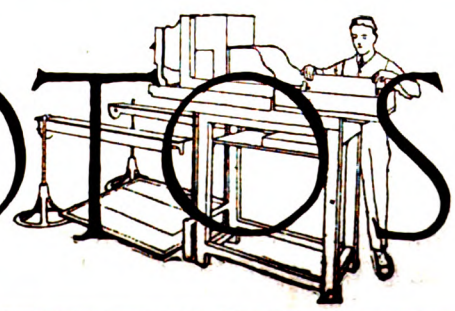
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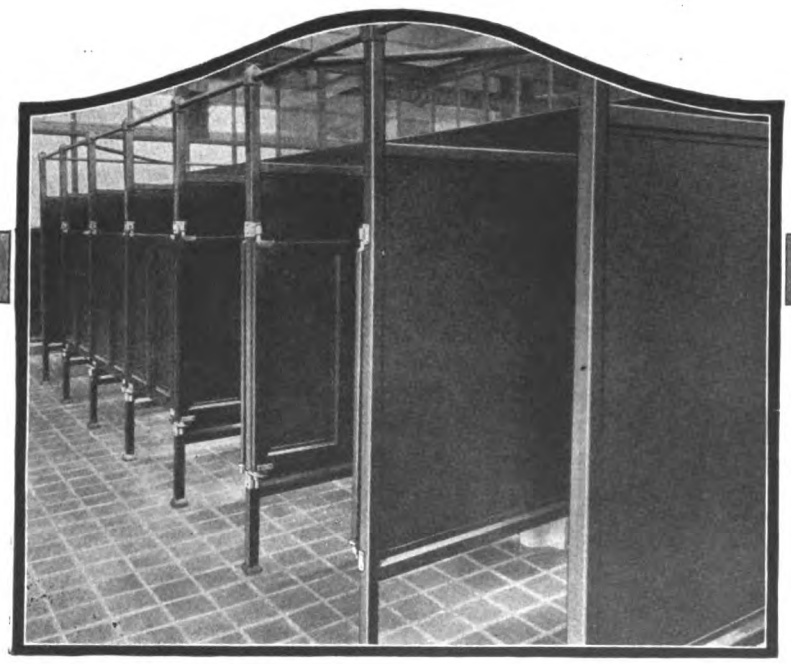
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SANYMETAL Toilets in the National Tube Plant, Lorain, O.

The Toilet Partitions Do Make a Difference

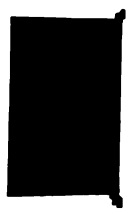
CLEAN-CUT, sanitary toilet compartments — like this SANYMETAL installation in the Lavatory Building at the Lorain, Ohio, plant of The National Tube Company— *do* make a difference. They make a difference in the attitude of employe s toward any company, and in the cost records of the company, too. For the up-keep on SANYMTEAL is next to nothing.

Even if you are not expanding your plant right now, it may pay you to install better toilet accommodations in your present buildings. Remember that SANYMETAL can easily be moved and re-erected.

Built in flexible units, easy to install in any space or layout, SANYMETAL, when erected, is and remains absolutely rigid. Made of the famous rust-resisting Armco Iron, with all hardware and every base casting electro-zinc plated by our special process, SANYMETAL Toilet Partitions cannot rust. They are entirely free from cracks to collect dirt and germs. The impervious baked-enamel finish, slant-lip moldings, and water-proof shoes, *shed* all dirt and moisture. SANYMETAL looks clean, is clean, stays clean. And all toilet doors are equipped with SANYMETAL Gravity Roller Hinges—springless, noiseless, never-failing and indestructible. Write for Catalog No. 2 on Toilet Partitions.

THE SANYMETAL PRODUCTS COMPANY
983 East Sixty-Fourth Street Cleveland, Ohio

You Can Buy—



SANYMETAL Steel Toilet Doors for use on marble or wood partitions. The cost of one of these doors, with standard hardware and baked enamel finish, is about the same as that of a wood door painted and fitted. We don't need to tell you which will last longer.

Sanymetal

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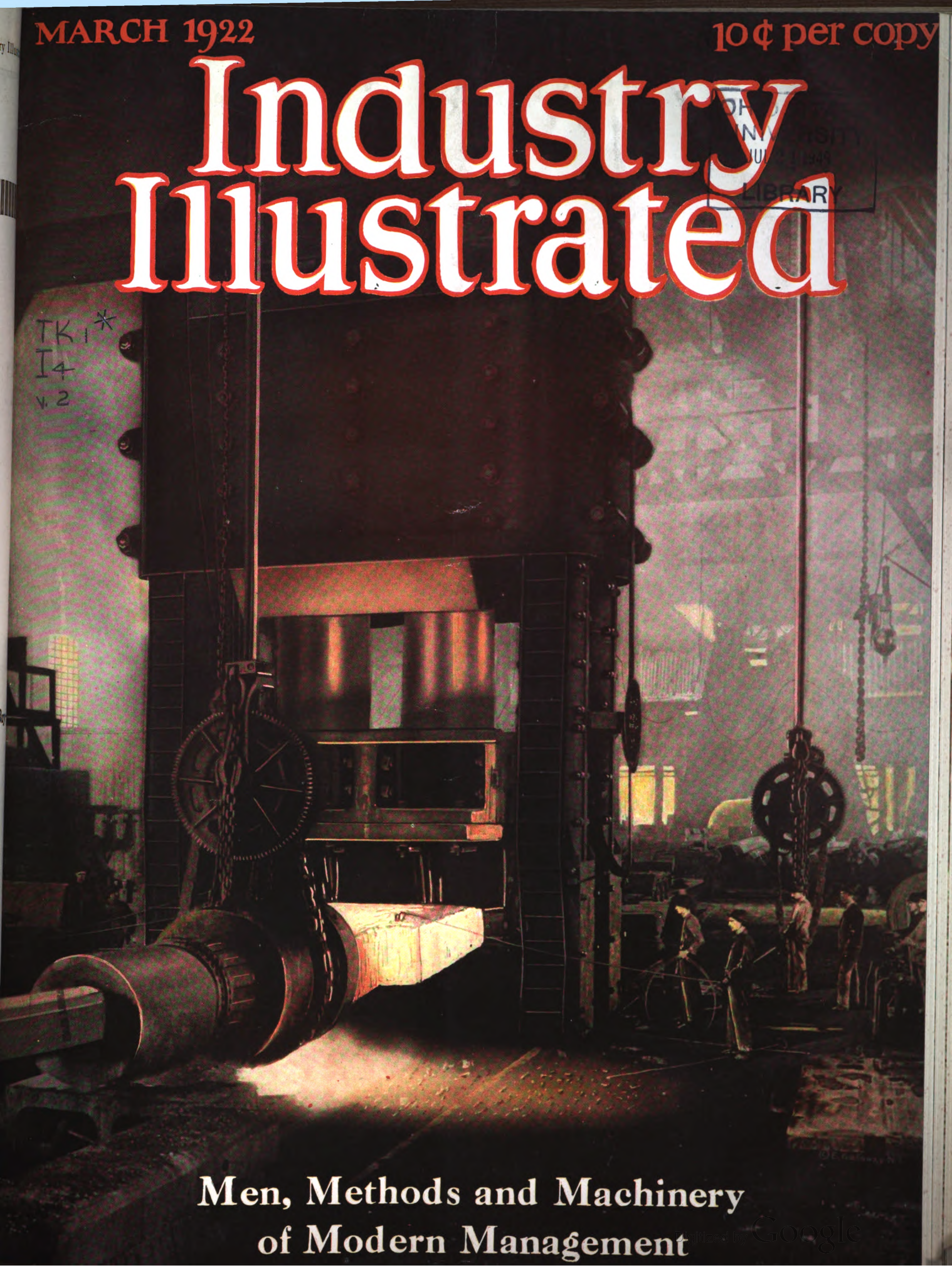
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Men, Methods and Machinery of Modern Management

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22 Years Service! Hyatt Roller Bearing Trucks



In 1900, twenty-two years ago, 180 Hyatt roller bearing equipped trucks were put in service at the Broad Street Station of the Pennsylvania Railroad, Philadelphia.

Recently the bearings on these trucks were examined and found to be in fine condition. *In fact, the original bearings are now being put into new wheels with a prospect of many more years of useful life to come.*

The original load for which these trucks were designed was 4,000 pounds but they are frequently loaded as high as 8,500 pounds. The trucks are lubricated with soft grease about twice a year.

Just consider the easy running, economical truck service the Pennsylvania Railroad has secured for 22 years by the use of Hyatt roller bearings!

Considering such records as these, can you longer afford to use any but the most economical, dependable haulage equipment? Specify Hyatt roller bearings on your next order.

Hyatt Roller Bearing Company
Industrial Bearings Division
New York, N. Y.

Tractor Bearings Division
Chicago

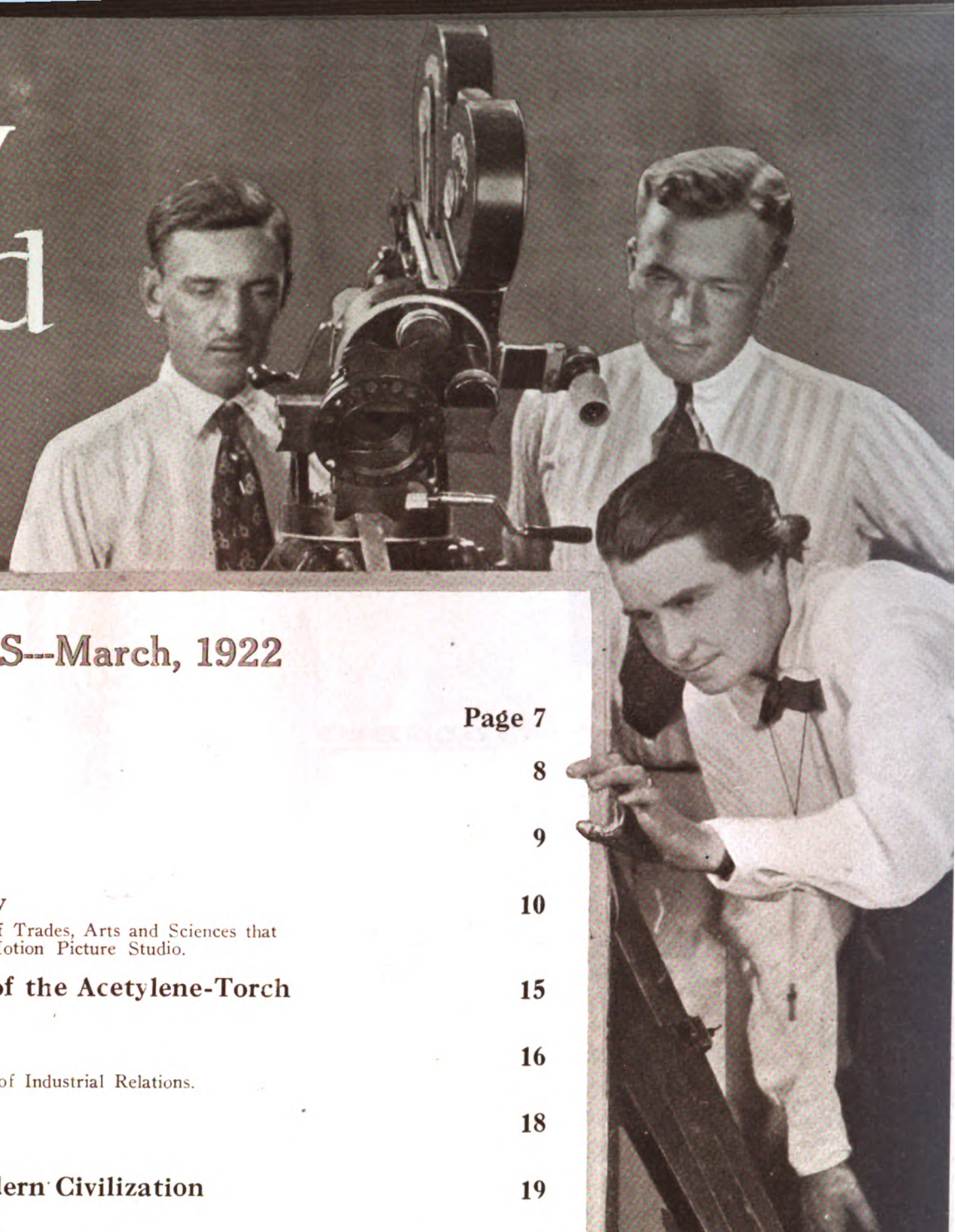
Motor Bearings Division
Detroit

Pacific Coast Division
San Francisco

USE HYATT BEARINGS ON YOUR LINE SHAFTS TOO
BULLETIN 125

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Industry Illustrated



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(For photographs not otherwise credited, we are indebted to: Aero Pulverizer Co., Pennsylvania Crusher Co., Paramount Pictures, and the U. S. Bureau of Mines.)

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One thing these have in common

They are successful. The Chicago Tribune is sold in a radius of which Chicago is the center. Nation-wide in its influence, its distribution makes it a local success.

Pillsbury's flour is sold throughout the United States. It is a national leader.

Oil from the new Carson Oil Company's plant in New Orleans is shipped over half the world. It is an international success.

The secret of the success of these products is quantity production and distribution—an open secret that is responsible for practically every product that can be used by large numbers of men and women.

Each of these companies has done away with waste motion in handling raw material, in manufacturing or packing, in warehousing and shipping—and each uses Lamson Conveying Systems.

Newspapers, flour, oil—it makes no difference what the product is, Lamson will find a system for handling it mechanically. Often a Lamson System will become the gauge of production—will ensure you getting your plant capacity every day. Often a Lamson System will save labor and valuable floor space and speed up production.

A Lamson Conveying System can be used for *what you make and sell.*

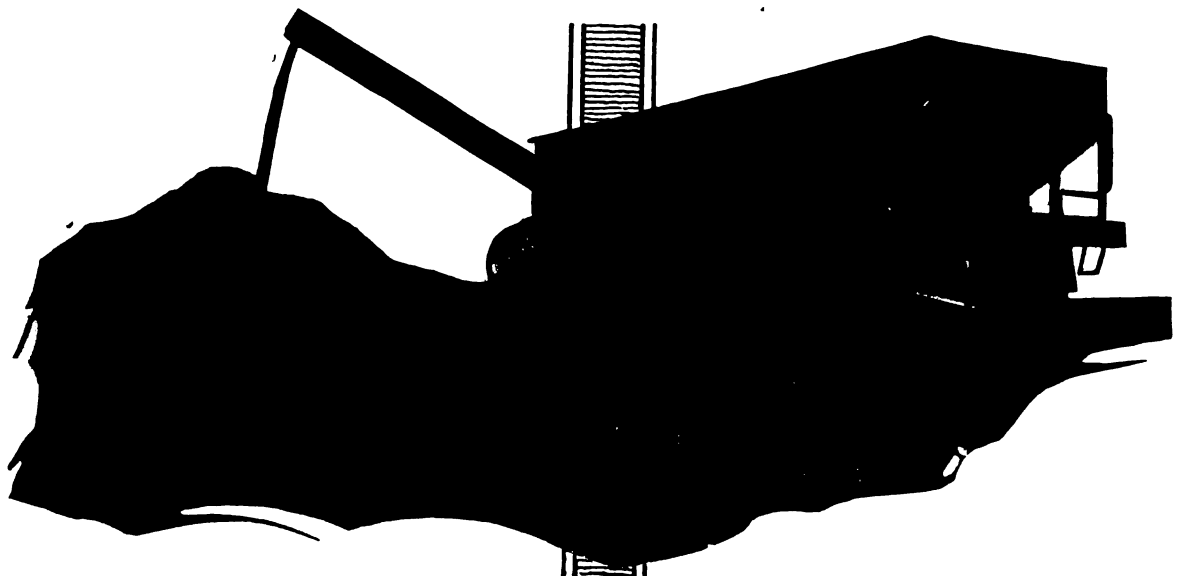
A letter or telephone call to our nearest office will bring a Lamson representative to you. He will be glad to tell you how a Lamson System will benefit you.

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THE SCOOP CONVEYOR

Saves 6 to 10 men handling material

WITH the Scoop Conveyor—unloading cars, loading trucks, storing, reclaiming or transferring materials can be done twice as quickly and with one-half to one-quarter as many men as with old fashioned methods. It handles coal, coke, ash and similar material at the rate of a ton a minute without expensive, backbreaking, laborious hand shoveling.

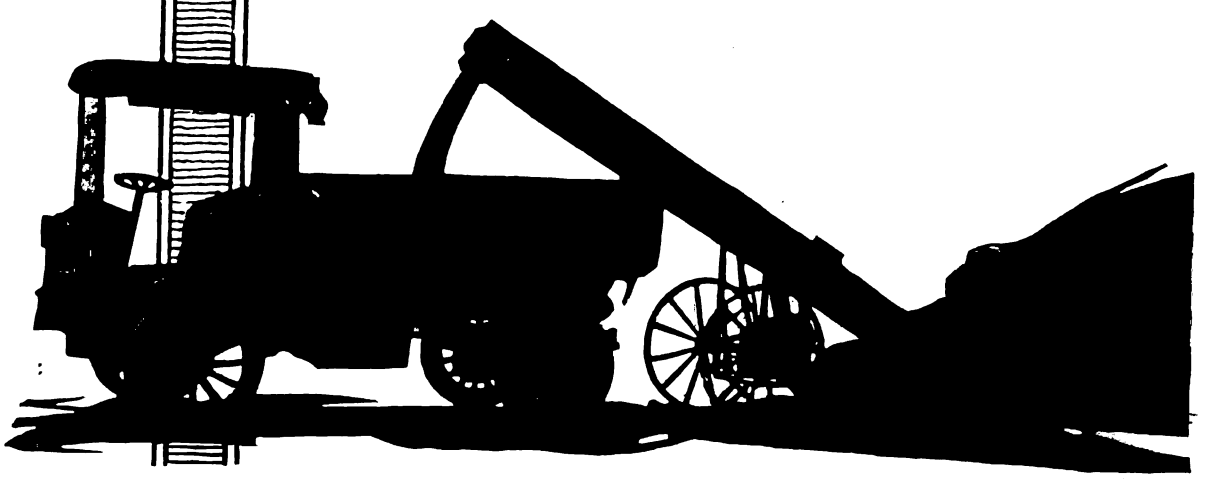
It saves money by eliminating laborers on this kind of work and by reducing idle time of other equipment as well as by speeding up production.

This light weight portable conveyor is a complete answer to conveying problems at thousands of plants and its first and operating cost is but a fraction of the cost of a more elaborate but no more capable conveying system.

Write for our catalog No. 63 giving full details.

Portable Machinery Co.

Passaic, N. J.



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"We tried for years; but couldn't do it"

This was the exclamation of one manufacturer to a competitor, a client of ours, in referring to the successful sales promotion of the latter's small electric hoist.

FOR many years there have been small electric hoists of a number of makes. Yet within a few months our client secured wider distribution for his hoist than his largest competitor had found possible in six years!

Our coöperation began while this small, general utility hoist was still in the "planning" stage. We investigated the possible market; competing machines; the sales policies behind them. We then submitted a report and recommendations and suggested an easily remembered, unique, appropriate name.

Advertising copy was planned and written for twenty publications, national, technical and trade; seven pieces of direct by mail advertising were prepared; special "dealer" letterheads and business cards were designed; leather bound "manuals" for dealers and salesmen were made up. *And all of this correlated advertising work was merely a part of our usual "service."*



The Result?

One hundred and fifty inquiries from the first advertisement inviting dealer correspondence.

One hundred hoists sold within the first month.

A new "Small Hoist Division" of the Sales Department formed within the first two months.

"Dealer" advertising suspended within two months to enable client to catch up with dealer demand.

An entire organization "keyed up" to a new machine and to the new ideas behind it.

And now, four months after first advertisement, returns continue unabated.

Ours is not a "general advertising agency." It is a "business organization" of men trained to render effective advertising and sales promotion service exclusively to manufacturers of mechanical and electrical machinery, appliances and products.

To those interested we extend an invitation to write for complete particulars, or better yet to call upon us, meet our staff and learn our methods.

Of our twenty-five clients, seven were added last year, two have been with us for two years, five for three years and eleven have been with us from four to ten years. A steady, consistent growth since our business started ten years ago.

RICKARD
& COMPANY, INC.
PRODUCTIVE PUBLICITY
25 Spruce Street, New York City

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Industry Illustrated

John H. Van Deventer, Editor

W. Thomson Lees, Associate

Reginald Gordon, Associate

EDITORIAL

The Magical Ears

STORIES of magic and magicians have always been of universal human interest. They appeal to the imagination.

The old fantastic tale of the magical spectacles whose wearer could see the fairies and brownies invisible to other mortals has been rivalled by the present-day practical story of the magical ears. The possessor of these ears can hear music and conversation, song and story where silence reigns for the ordinary mortal.

Radio is the nearest thing to magic that has yet been developed, which is the reason for its remarkable appeal to the human imagination. So many mortals crave these magical ears that aerial antennae are materializing over communities almost as rapidly as spider webs form upon dew-laden meadows. And factories making wireless equipment are six months behind orders.

Everything that is new and wonderful seems to teach us a lesson about other things besides itself. And radio is no exception. Just as the average man is surrounded by unheard radio messages, so, too, is he surrounded by unseen opportunities. The salesman returns from an unfruitful trip. He says, "There is no business to be had." But he is wrong. He is surrounded by opportunities for business that he cannot see. The inventor, searching for a better way to accomplish a useful purpose, becomes discouraged. He says, "It cannot be done; there is no way to do it." But he is wrong. He is surrounded by hundreds of solutions for his problem that he cannot see. The ambitious poet, author or artist searches the realms of fact and imagination for a new theme, and despairing, exclaims, "There is nothing new under the sun." But he is wrong. He is surrounded by new themes which, could he but see and seize them, would bring him immortal fame.

It is just as possible for us to school ourselves to see these unseen opportunities as it is to hear these "wireless" messages if we perfect our receiving apparatus. We must "tune up to the right wave length." We must think in the measure of the messages that we would receive. One cannot think in terms of dollars and produce Dante's Inferno. Nor can one train his eye to petty things and expect to visualize big opportunities.

And the radio receiver is selective. Its possessor must tune his instrument to the proper wave length whether this be the 360-meter song of a primadonna or the 2500-meter trans-Atlantic message. Otherwise the magical ears, surrounded by dozens of simultaneous voices, would hear only a jumbled confusion of tongues. The power of selection gives the ability to exclude all but the one message desired. So, too, if we would see clearly the big opportunity among all the varied opportunities that surround us we must train our minds to be selective—excluding at will, all messages that are not important or helpful.

Receptivity plus Selectivity—this is the formula both for magical ears and magical eyes.

Additional copies of this Editorial will be furnished on request

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American Industrial Vitamines

Are We Properly Feeding In dividual Initiative?

An Interview with Dr. Byron E. Eldred



Dr. Byron E. Eldred graduated from Dartmouth College with the degrees of B. S. and D. Sc. He has devoted twenty-five years to research and science during which time he has invented and perfected many commercial processes especially in the fields of special metallurgy, combustion of fuels and organic chemistry. He is the recipient of the John Scott Medal from the City of Philadelphia, and the Elliott Cresson Medal from the Franklin Institute, and has to his credit more than one hundred patents.

OUR ancestors knew nothing about the recently discovered food vitamines which, so authorities on dietetics tell us, are all important in shaping individual physical growth. Our children, and their descendants, if this is true, will find conditions favoring progressive physical improvement.

But what about *accomplishment vitamines?* A nation that progresses physically but that retrogrades mentally goes backward instead of forward. In these days of communistic, socialistic and paternalistic trends, are we neglecting the proper feeding of individual initiative — disregarding, or rather tending to disregard, the vitamines that develop individual initiative and that have been responsible for our miraculous growth, in less than 200 years, from a backwoods colony to the richest nation in the world?

No class of Americans have done more for America than its inventors. A successful inventor is the embodiment of accomplishment through individualism. So we editors decided to get the views of a successful inventor on this subject and selected Dr. Byron E. Eldred as typifying the modern scientist-inventor, with whom accomplishment is not a matter of inspiration so much as it is careful and painstaking research, accomplished by engineering analysis and mechanical progression from cause to effect. Dr. Eldred, as many of our readers know, is the engineer who produced the sorely needed substitute for platinum in incandescent lamp construction, at the time when our supply of this material, mainly derived from Russia, was seriously curtailed because of war and not obtainable from other sources in sufficient quantity to supply the demand.

"Are we, as a nation, properly feeding American individual initiative with the vitamines of achievement?" we asked Dr. Eldred. "In other

(Continued on Page 51)

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Ventilating the Big Tunnel

Problems Confronting the Engineers of the New York-New Jersey Vehicular Tubes

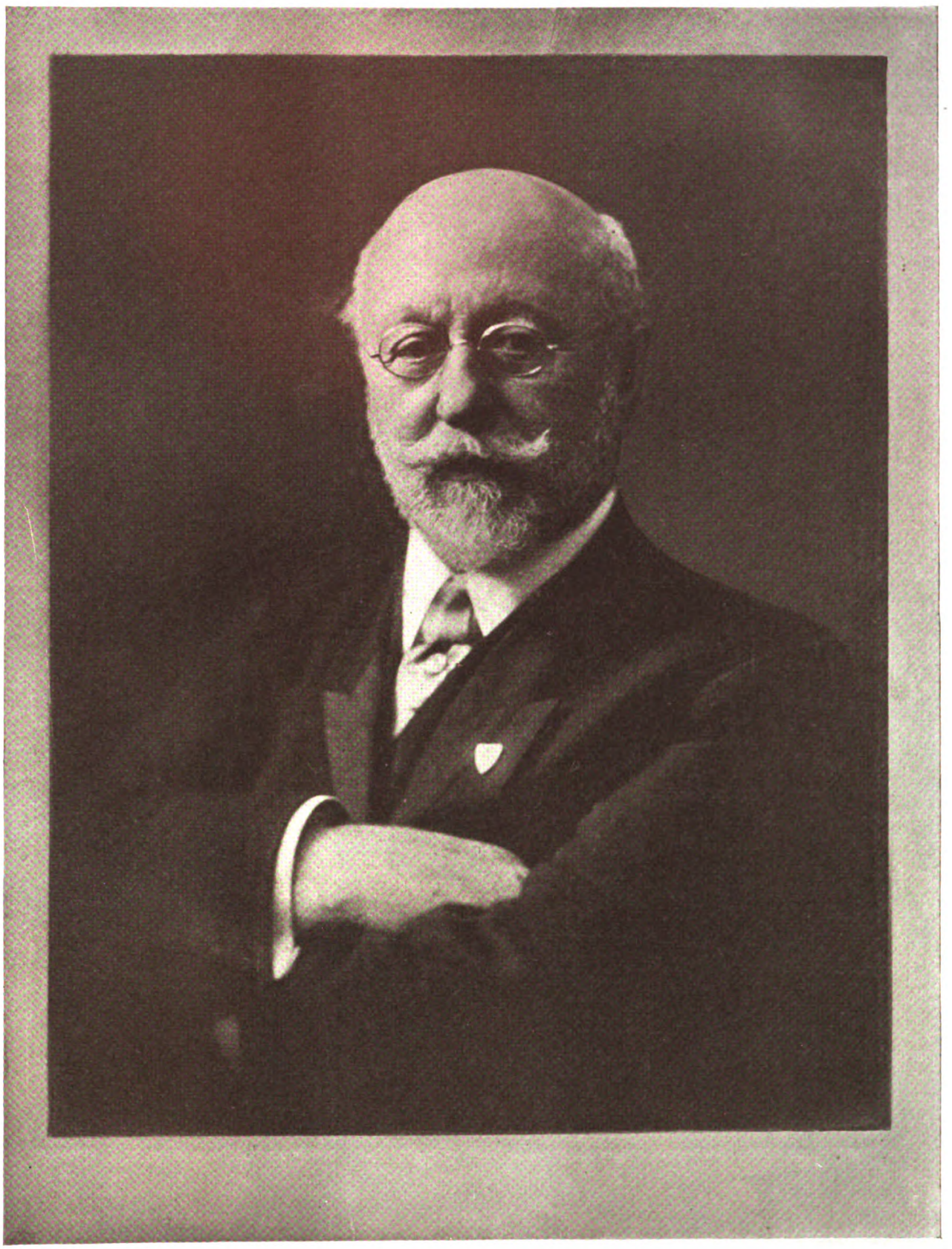
An Interview with William J. Baldwin

THE proposed New York-New Jersey vehicular tunnel under the Hudson River between Manhattan Island and Jersey City presents a difficult problem in ventilation. Anyone who has noticed the smoke and disagreeable odors filling the air of a street crowded with motor cars or who is aware of the frequently fatal results of running an automobile engine in a small, closed garage can realize the problem that must be solved in the New Jersey tunnel if the air in it is to be made safe and endurable for the drivers and passengers who will pass through it in large numbers.

With these ideas in mind, we decided to obtain an expression of opinion on the subject from an engineer who has had many years' experience in the field of ventilation and whose professional life has covered such a wide range of activities as naval architecture, warming and ventilating of public buildings, telegraph and telephone cable subways, a professorship of thermal engineering and editorship of a leading engineering weekly. Such a man is William J. Baldwin.

"The engineers of the New Jersey vehicular tunnel," said Mr. Baldwin, "have estimated that it will require a power plant of 8000 horse power capacity to force sufficient fresh air into the tunnel continuously to maintain its atmosphere in a condition fit and unobjectionable for breathing. We must bear in mind that the dangerous constituent of motor exhaust gases in a vehicular tunnel will be the deadly carbon monoxide (CO). In the capacity of consulting engineer for the New York Telephone Company and the Empire City Subway Company, I was engaged in investigating the gases, that leaked into the cable ducts and manholes and passing along the ducts, accumulated in the manholes. Formerly, it will be remembered, gas explosions in the manholes were of frequent occur-

(*Continued on Page 39*)



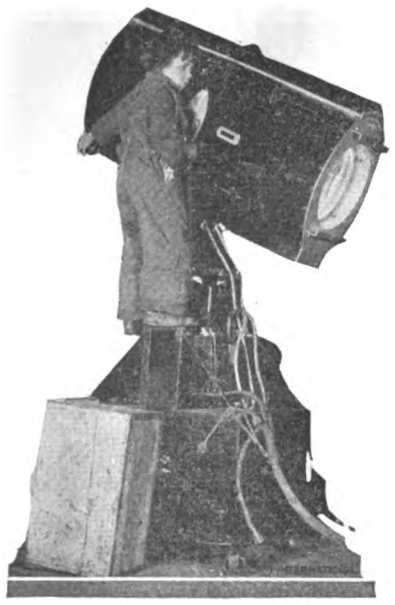
Mr. William J. Baldwin was educated as a mechanical engineer and naval architect and during the civil war worked with Donald McKay at his East Boston yard on the monitors and other war vessels. He was engineer of many of the earlier high buildings in New York and consulting engineer for the U. S. Government on many institutional buildings. He is consulting engineer for the New York City Health Department hospitals and for more than twenty years has acted in that capacity for the New York Telephone Co. on its underground conduit work.

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The Mechanics of

The Huge Organization of Comprises the Modern

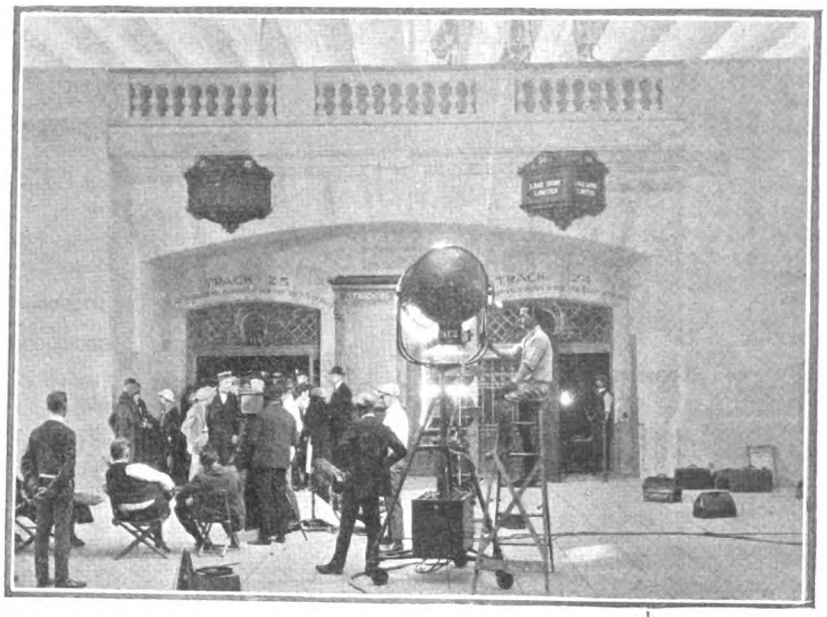
BY W.

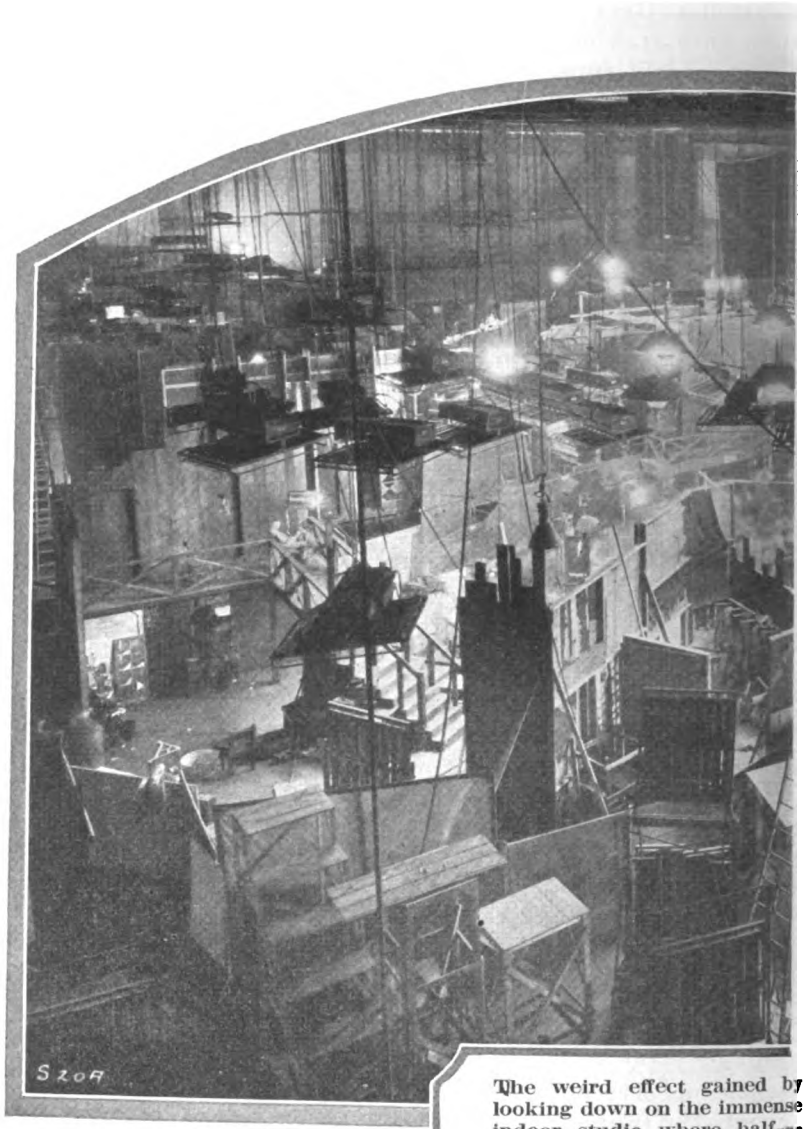


Jackie Coogan wants to be an electrician when he grows up. Here is "The Kid" beside one of the giant studio lamps, largest of its kind ever used for motion picture work. It can throw a parallel beam for a distance of twenty miles

Below—Tom Forman and his staff making a scene with Thomas Meighan for his Paramount Picture, "If You Believe It, It's So." (See text at the right)

IN KEEPING with the illustration immediately below, at the left, this article ought to begin: "Catching the 20th Century Limited at Grand Central Terminal, we were off on our three thousand mile journey to the land of the camera—" But, as a matter of fact, the illustration itself was not taken at Grand Central Terminal—it was taken at the Lasky Studio out in California. It is just one of those





The weird effect gained by looking down on the immense indoor studio where half-a-

Below—Filming shipwreck scenes for "A Wise Fool" on the large ship structure especially built and flooded for the purpose.





In order to have adequate light for filming scenes laid away from the studio, this self-contained generator and switchboard set has been designed to supply the necessary current.

Tractor truck which is used as a "roust-about" at the Lasky Studio.



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the "Movie" Industry

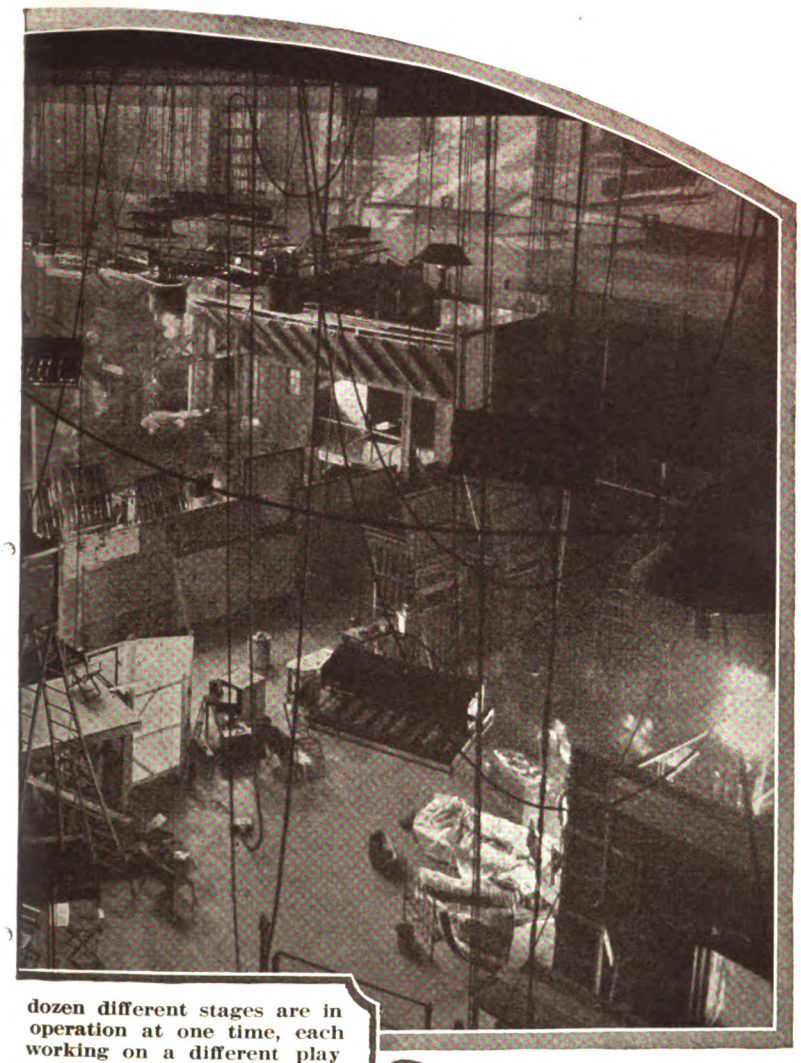
Trades, Arts and Sciences that Motion Picture Studio

THOMSON LEES

things which are not what they seem. Having occasion to film a scene whose action takes place in the Grand Central Station, the thing resolves itself into a question of cost. Obviously, to transport the director, camera men and actors (apologies to the latter for naming them last) all the way from Los Angeles to New York would involve an immense amount of time and money. Therefore, instead, the setting is duplicated—even to the minutest detail—in the Los Angeles studio; and when it is flashed on the screen, even the most hardened and captious commuter is ready to swear he knows the exact spot shown.

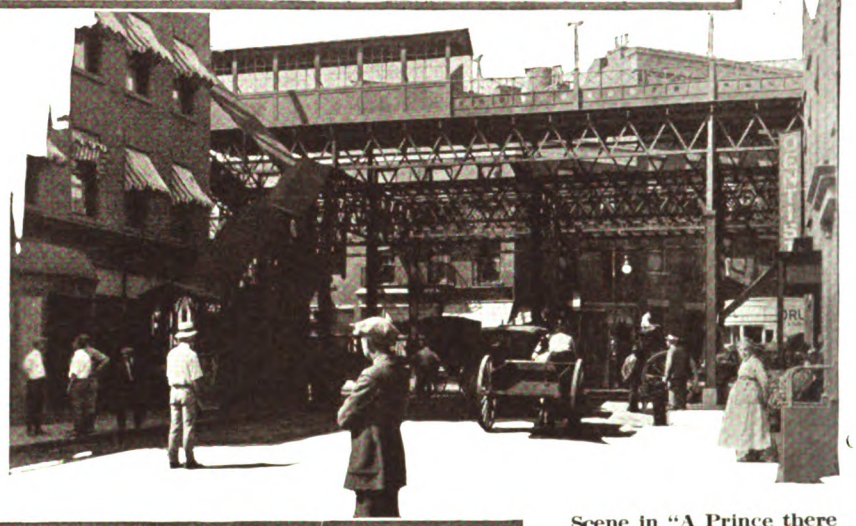


Below—The Property Department must be prepared to furnish anything from stove-pipe to bird-cages.



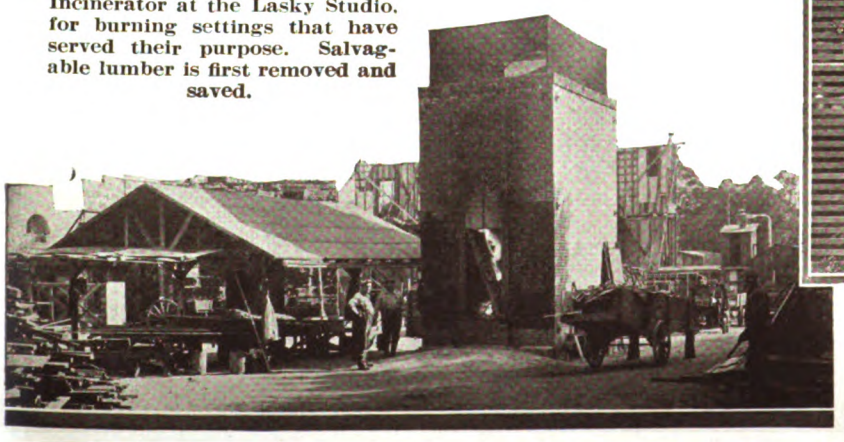
dozen different stages are in operation at one time, each working on a different play

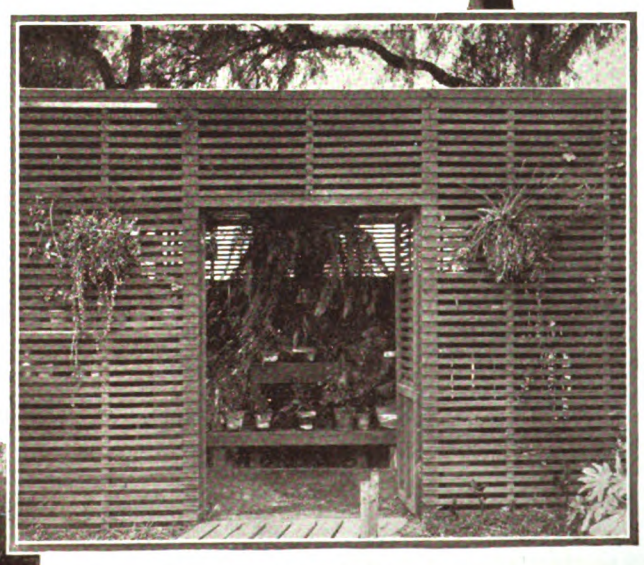




Scene in "A Prince there Was," for which a section of New York had to be reproduced out in California. (See text)

Incinerator at the Lasky Studio, for burning settings that have served their purpose. Salvagable lumber is first removed and saved.





The nursery, where plants are cared for under proper conditions, to serve in supplying the necessary touch of natural local color for special settings.

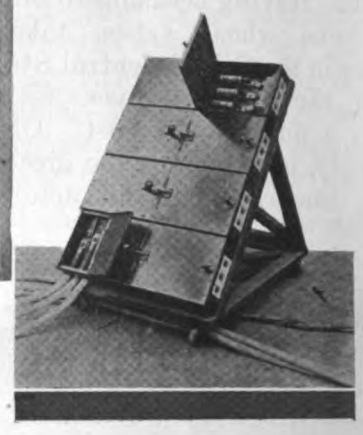


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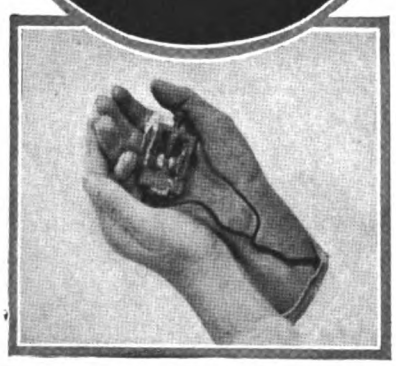
When this actor applies his match to the gas-jet, the camera-man throws the switch which floods the scene with light from the arc at the left. Note how weakly the flame of the match shows in the picture.

Below—One of the many types of portable switch-boards developed to meet the requirements of motion picture work.

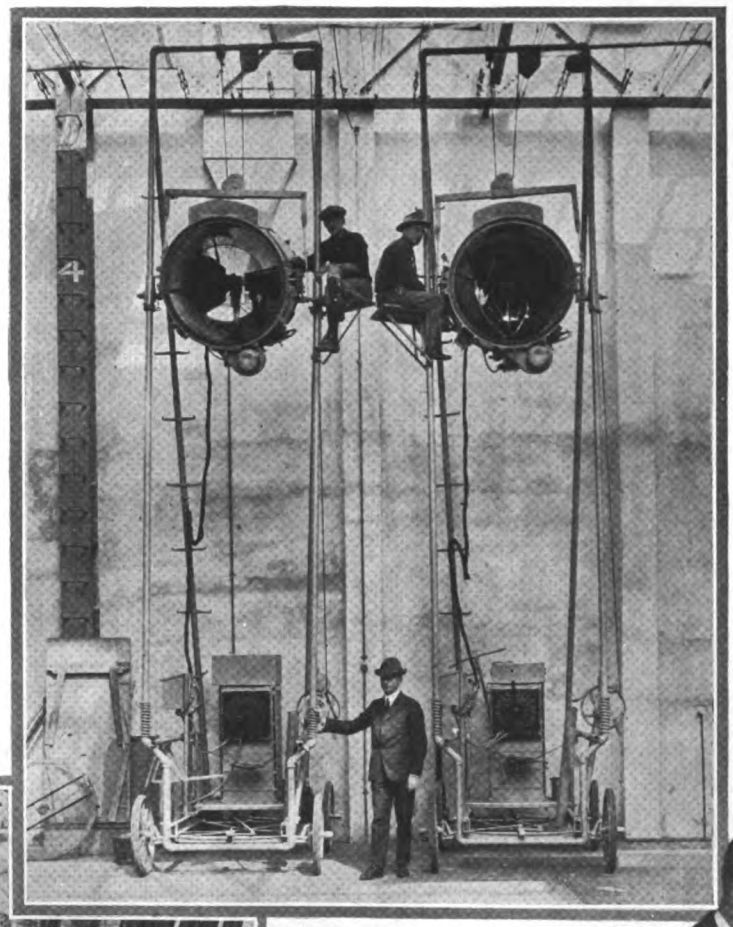


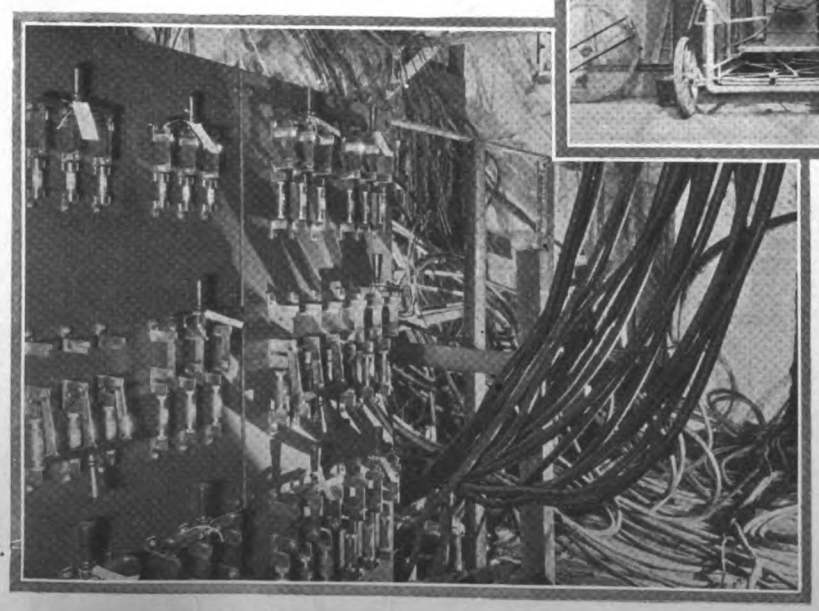
Below—The striking effect of a man's lighting a cigarette in the dark, and (below)—





—the miniature arc-light by which the above effect is actually obtained.





Some of the lighting panels for the Lasky Studio, in process of installation. The electrical requirements of the "Movies" ought to make nearby central-station managers happy.

F. S. Mills, lighting expert, measuring the amount of light on a setting, by means of an illuminometer.



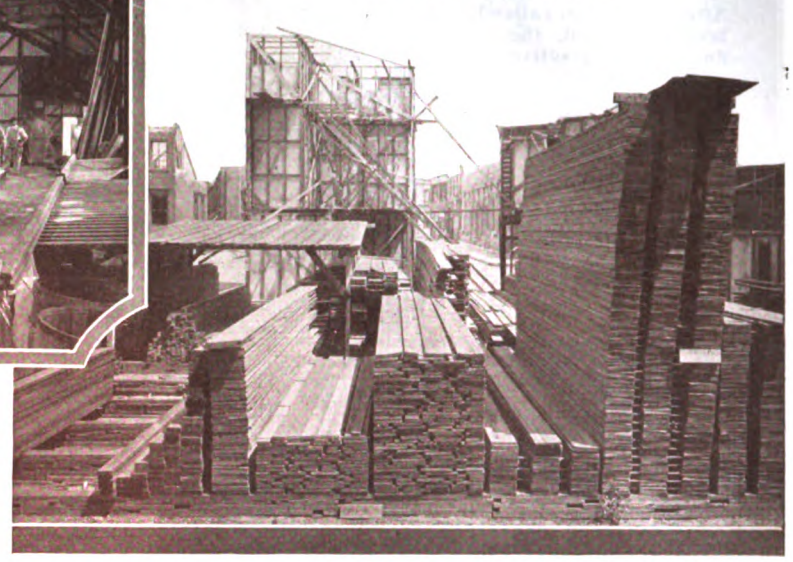
In the old days, faced with such a problem, the director would have selected a "back-drop" or painted curtain that gave an idea of the setting—perhaps he would even paint on it in conspicuous letters "GRAND CENTRAL TERMINAL," so there could be no mistake—and let it go at that. But movie audiences have grown beyond that point. They demand an ever higher standard of perfection; and in the competition for the public's fickle favor, directors have evolved some truly wonderful results.

If you were to take this view of (apparently) the train-shed gates, and compare it with a photograph of the actual place it is supposed to represent, you would discover some interesting facts. If, in actual fact, there were a slight difference

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The Studio Carpenter Shop is a sizable place all by itself. Not only is there a good deal of space, but the mechanical equipment for wood-working is up-to-date.



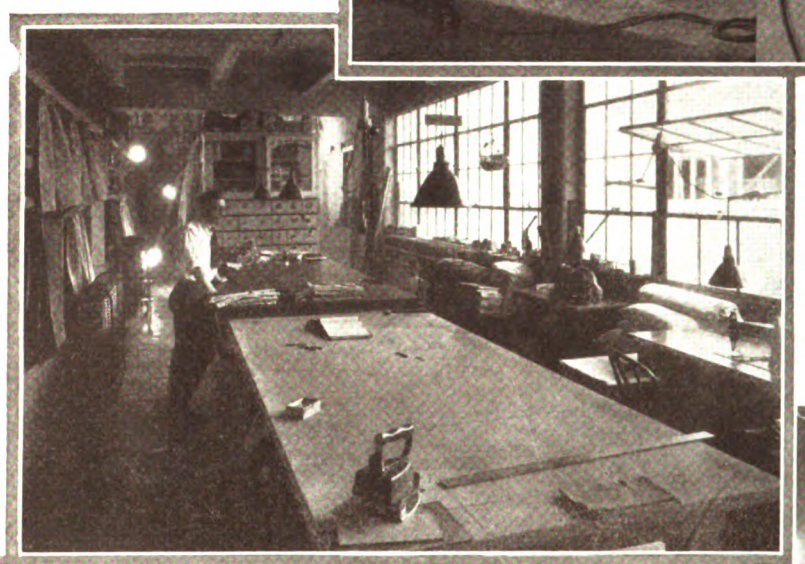
A small section of the lumber yard, and (in the background) part of a set under construction.

in the height of the line of slabs on either side of the actual gate—the other, the replica, would show the same difference. Why? Because, in duplicating existing settings, the modern studio is not content with approximation: it demands exact fidelity to detail, so that anyone who may later see the picture, will be unable to discover the deception. This is not because of the fear of criticism—no secret is made of the fact that such deception is practised—but any little jarring note would tend to destroy the verisimilitude of an entire picture.

The first step in securing this exact replica of a setting, consists in taking a photograph (usually, several photographs from different angles, to get the perspective) after first placing a yardstick where it will show up in the picture. By this very simple means, we are told by the Art Department of the Lasky Studio, any building, of any size and anywhere in the world, can be faithfully reproduced on the studio lot. From the photo-



A corner of the electrical department, where improvements are worked out, and where repairs to electrical equipment are handled.



At the left—The drapery department would be quite capable of furnishing draperies for several mansions simultaneously.

The Paint Department has progressed away beyond the old days of black and white, and now carries all the colors of the rainbow.





The blacksmith-shop makes, on the spot, the necessary braces and struts, and may be called on to produce hand-wrought designs for special sets.

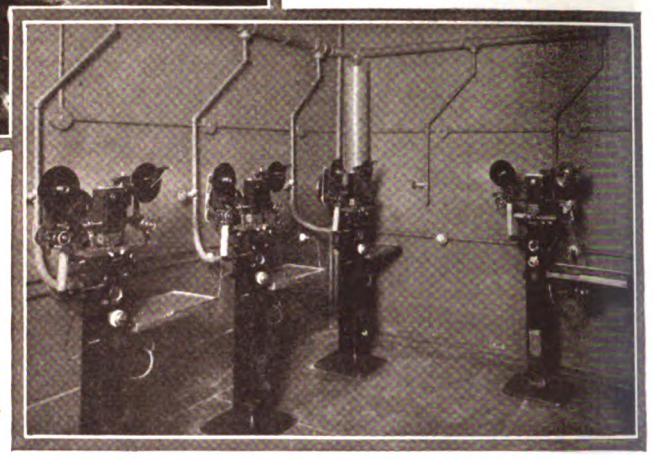
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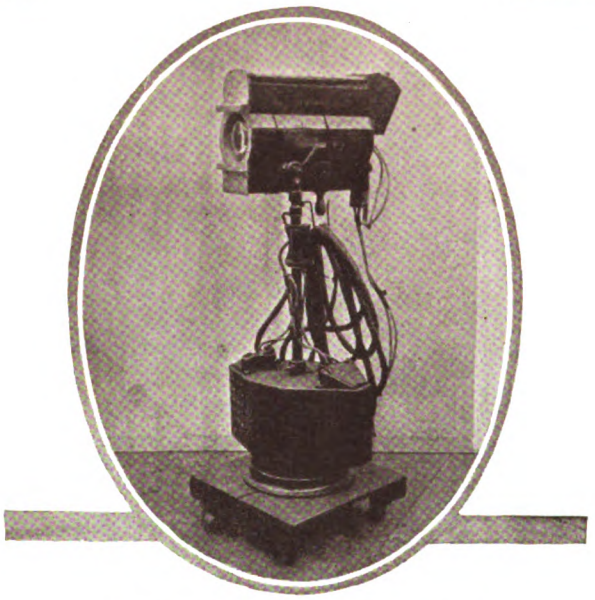
After the film negative has been developed, the production of positives for projection is done by machines at high speed.



These girls cut the negative to match the original sample print. The number of positives that can be made from the original is, of course, unlimited.



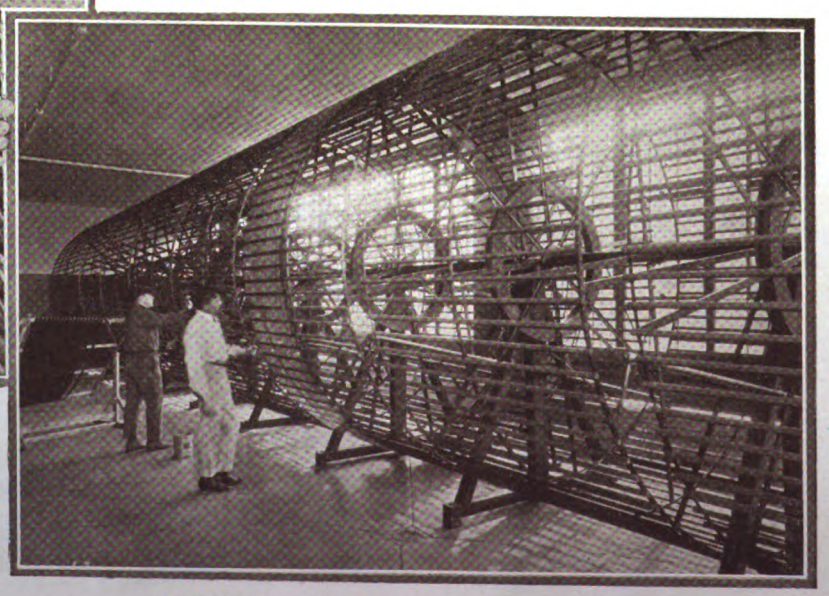
Perforating machines, which punch the sprocket-holes in the finished films.



Floor spotlight, used, for example, in throwing light on a face shaded by a hat-brim.



Close-up view of inspection of film on the dryer.



Some of the immense reels on which the film is dried, undergoing inspection here before passing on, in case a re-take may be necessary.

graph, draftsmen draw the plans to scale—leaving out whatever parts fall outside the focus of the camera which is to film the scene—and the carpenters and painters work from these plans.

It is not very many years ago that the "art department" of a motion picture company consisted of one or two sign painters and a kid handy with the brush. Now-a-days, not only does this department include scenic painters of highest skill, but it requires a complete filing system for hundreds of photographs of special scenes and settings which can at any time be reproduced by the method outlined above. Special men are assigned to the job of securing photographs for this file, and the Art Director always has on hand a variety of "doorways," "French Cathedrals," "Public Buildings," "Hotels," "Country Stores," and so on, including many well-known buildings; so that when a play calls for any particular setting, it can usually be constructed with little loss of time.

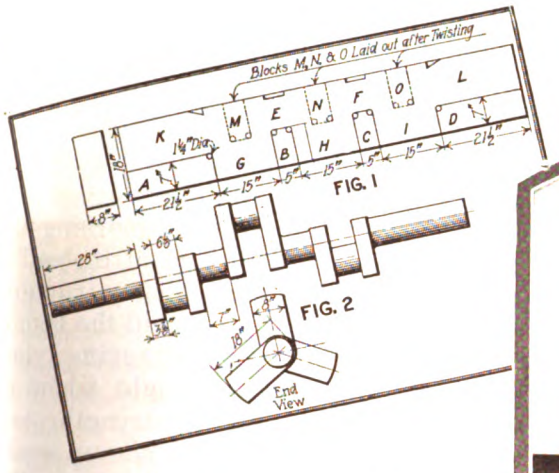
The Art Director's job, however, does not end there. He must be able to "dress" a setting appropriately. An exter-

(Continued on Page 30)

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Forging Crankshafts with the Aid of the Acetylene Torch

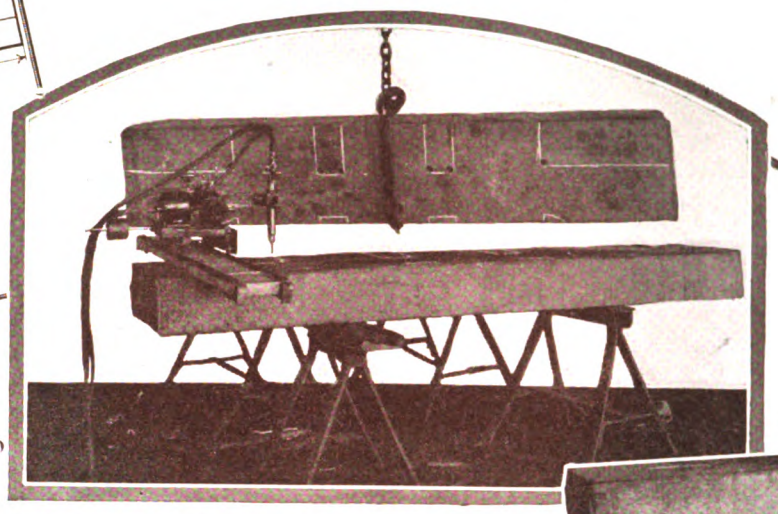
BY FRED E. ROGERS



FORGING large multiple-throw crankshafts for steam and gas engines is greatly facilitated by first cutting a blank prismatic forging of the required size with the oxy-acetylene torch to a rough outline, and then cutting out the metal between the crank cheeks when the shaft has been twisted and the ends and bearings have been forged down to size. Cutting with the torch is much cheaper than drilling and sawing out the portions to be removed before doing the subsequent operations. It is much less arduous also than chopping out hot metal under a steam hammer, which operation is hardly feasible on three-throw crankshafts unless the shop is well equipped with fixtures and surface plate for truing up the distorted parts. When a forging exceeds 3 or 4 inches thickness, cutting with hand torches is hardly feasible, however, as few operators can manipulate the torch with as much precision as to insure a roughed out blank that will work out to the required dimensions.

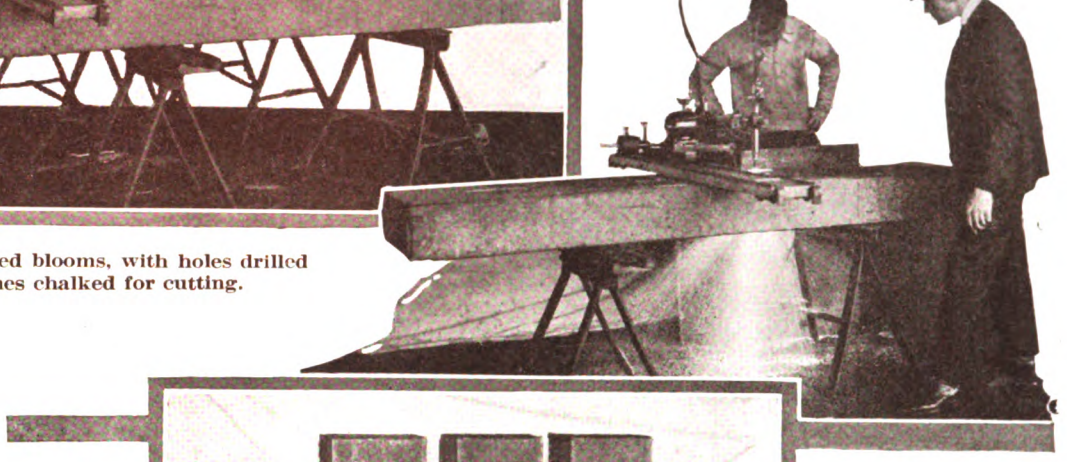
Mechanically-operated cutting torches, of which the Radiagraph is an example, are admirably suited to heavy crankshaft cutting, both for the preliminary operations and for the subsequent cuts when the cranks have been twisted

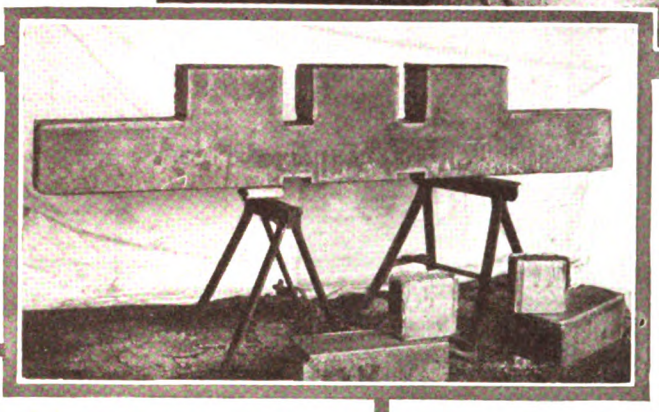
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Above—forged blooms, with holes drilled and lines chalked for cutting.

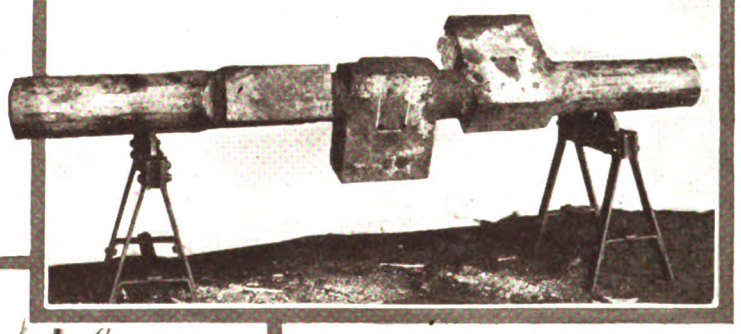
Below—the torch in process of cutting out the blanks.

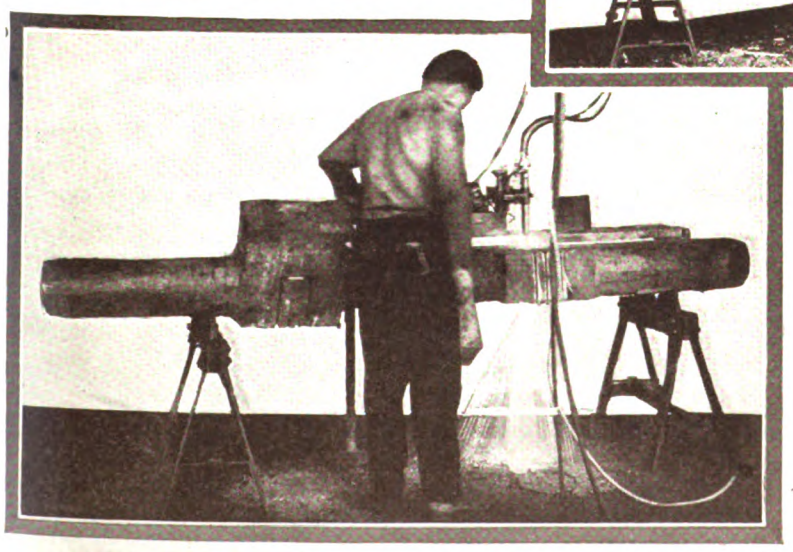




At the left—the forged bloom, with first cuts completed, ready for twisting.

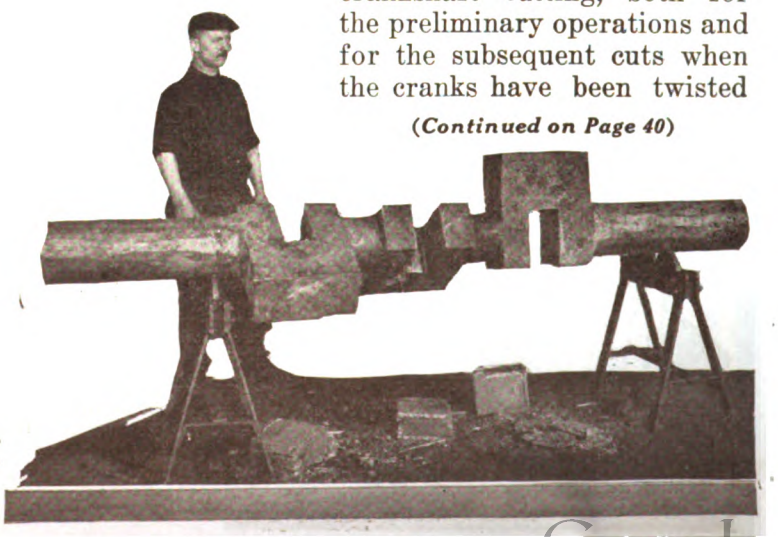
Below—after twisting under the hammer, the forging is ready for removal of the last three blanks.





Above—carrying out the last cutting operation. (See text for speed of cuts.)

At the right—the shaped, three-throw crankshaft, ready for machining and finishing.

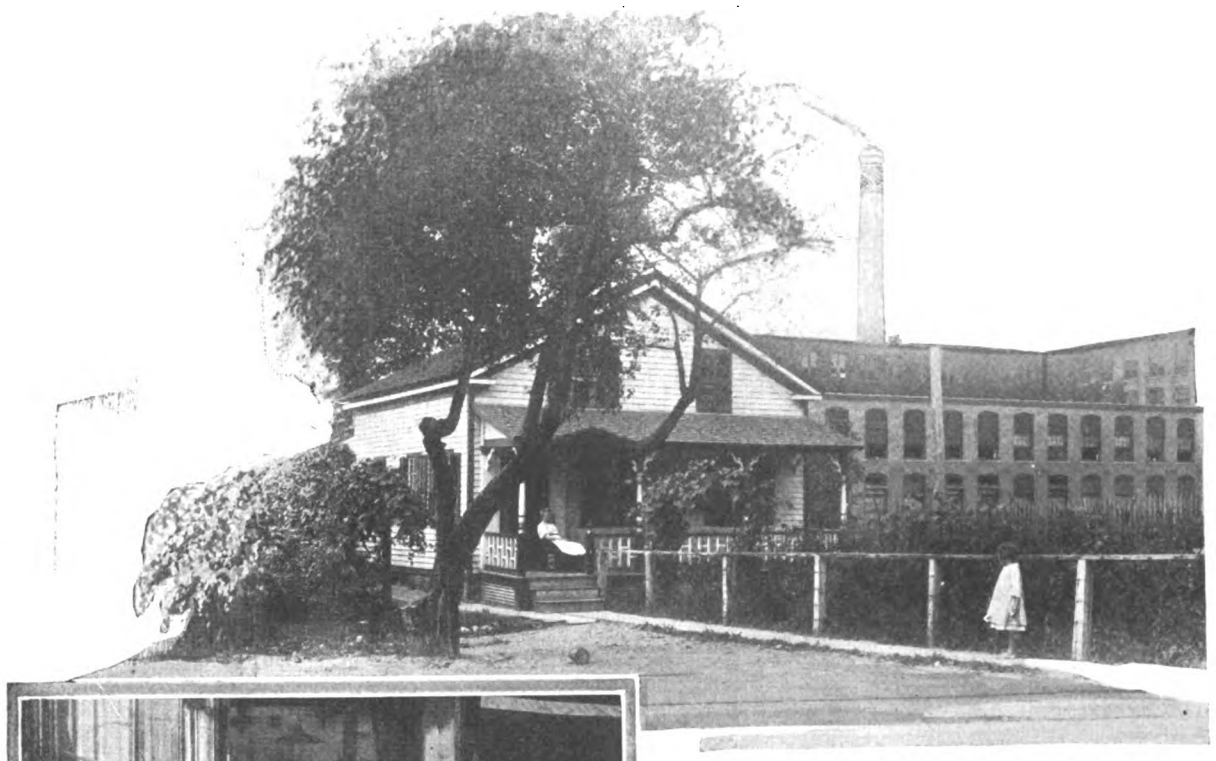


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Even More Than Common Sense

A Worker's Interpretation of Industrial Relations

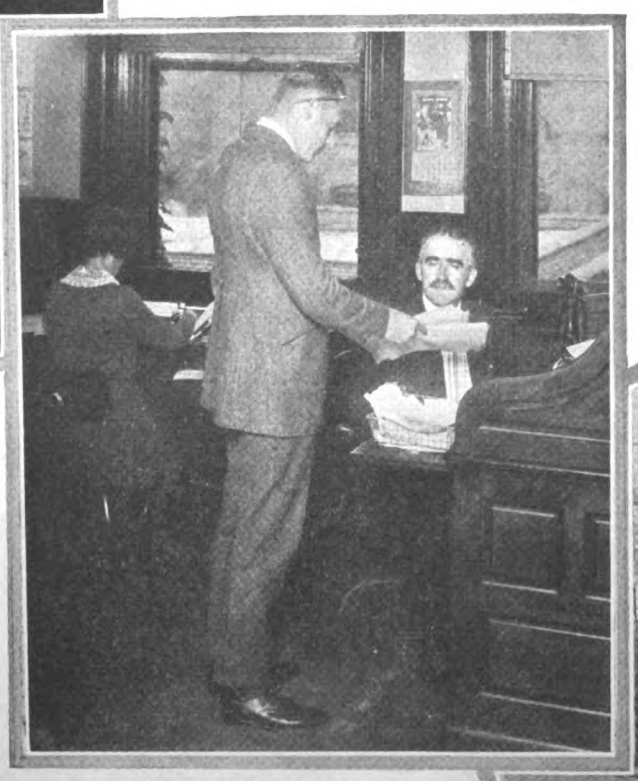
By W. H. Holmes

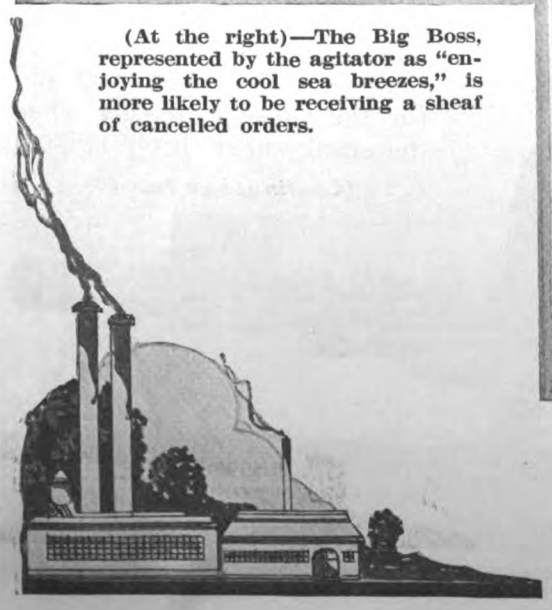


"Jones died leaving his wife well provided for; by industry and thrift he saved money and acquired property."



(At the left)—The workers form their own opinion of the organization solely on the basis of the representatives with whom they come in contact.





(At the right)—The Big Boss, represented by the agitator as "enjoying the cool sea breezes," is more likely to be receiving a sheaf of cancelled orders.

"Get a carload of paper," said the Efficiency Expert... "Then engage a force of men to design the hundreds of charts we will need."



"I TELL you that you men are slaves! Slaves to a machine! Worse, by far, than the plantation slaves of before the war!" The agitator's voice rose to a vibrant shriek. "You are driven into the shops in the morning like cattle; driven in at the call of a warning whistle; running, when late, to avoid the lash of your bosses; dragging yourself away at night when released; your strength, and spirit sapped to pile up wealth for others! I tell you men that it is time to strike! Time to declare your manhood and become men. You toil and produce, but do you receive your due for the things you create! No! You get about one-eighth of what you produce. The boss gets the rest. Do you wish to continue in this degrading rut! No! You get about one-eighth men and fight along side of your brother workman for your just dues. The bosses have ridden you long enough. They have ridden you until your bowed backs are gallworn and broken! Throw off the shackles of bossism and join with us! The time is ripe! Now! The time to organize and to strike for your rights! Are you with us? You men sitting there, sweltering in the heat while your bosses are off enjoying the cool, sea breezes? Come, sign up like men! Be men, not slaves!"

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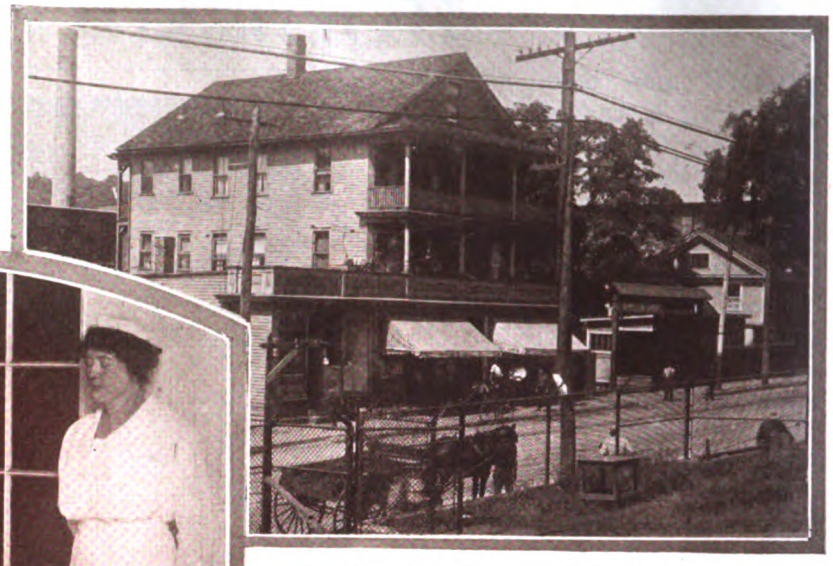


The speaker sat down, wiping the perspiration from his forehead. A score of earnest men rushed through the audience, passing out application blanks to eager, outstretched hands. With nervous energy they assisted the eager candidates to fill out the forms. As they finished, and had the last of the signed forms in hand, the organizer rose to his feet. "Brothers," he said earnestly, "tomorrow night we meet for the purpose of calling a strike. Let every man who has signed his name to an application here tonight be present; and let each bring along a friend. We'll tie this town up so tight that when we negotiate for a settlement it will be our committee dictating the terms, not accepting what the bosses have to offer!"

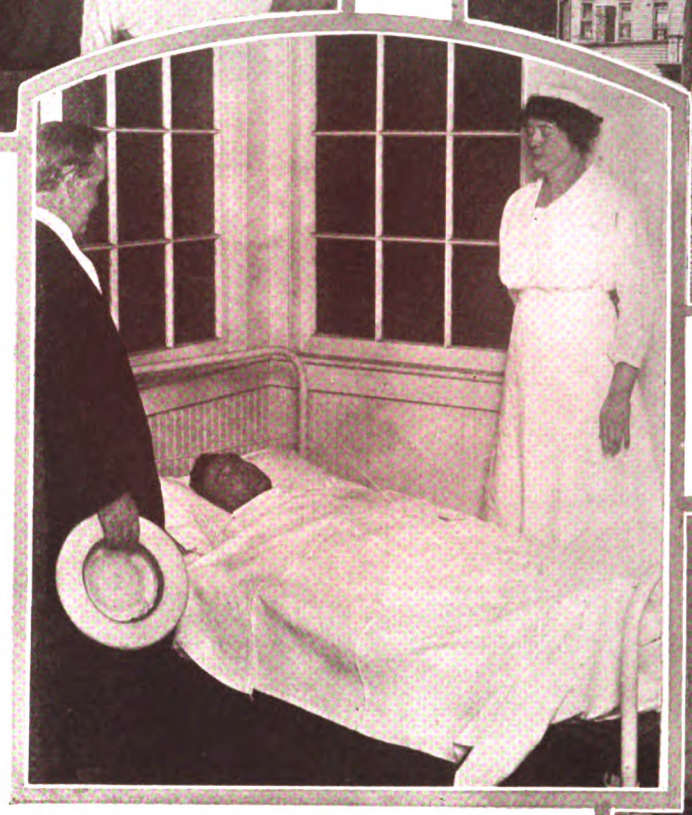
In the rear of the hall, an intent listener, a young, alert man, thought over the words of the organizer. Something of what he said, he felt, had grounds of reason, or at least they sounded logical. Still so

(*Continued on Page 55*)

(At the left)—"You have overlooked the fact that you, yourself, are Capital, and the men under you are labor. Talk to your men; meet them, and get their viewpoint—and see that they get yours."



"The stores, the markets, the houses in your community—these exist by virtue of the existence of your plant, on which they depend for support."



"Does a man lightly forget that you took care of him when he was sick?"

(At the right)—"Brown died of drink, and his wife is now Matron here in the shop. Of course it is necessary to assist them a bit."

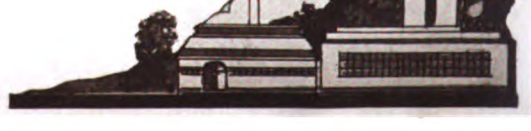




"There will be no strike! Loyalty is there; by reason of Jones; by reason of Brown and his widow; by reason of various similar examples of interest in your men's problems."



(At the left)—One of the small items that help to weld the chain; a man-to-man attitude between minor executive and the rank and file.



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A Pioneer in the Cement Industry

An Interview with Robert W. Lesley

SOME men seem able to crowd a vast amount of accomplishment into a short business career. Others dilute perhaps twice as many years with half as much accomplishment.

Some of us, noting this fact, wrongly conclude that there is a fixed sum total of effective effort, physical and mental, in each individual, and that the faster one achieves, the less will be his span of activity. This interview with Robert W. Lesley will help to prove how unfounded is this belief. Here is a man who, during his active industrial career of fifty-four years—he started at the age of fourteen and is still going strong at the age of sixty-eight—has been literally pitchforked (as he puts it) into dozens of big undertakings, almost any one of which would satisfy the average man as a satisfactory life-time accomplishment. It was Mr. Lesley, for instance, who did the pioneer work of establishing the Portland cement industry. His inventions were the basis upon which the American Cement Company was organized. He has been perhaps more than any other one man, responsible for the great development in the Portland cement industry, and has seen it increase largely as a result of his efforts from an output of less than 5,000 barrels per year to over 100,000,000 barrels per year.

In addition to a remarkable work in this industry and his association in such concerns as the Bearings Company of America, Giant Portland Cement Company, the Bonzano Rail Joint Company, the Jackson Mills Emery Company, the Surface Combustion Company, he has found time to establish and develop the "Concrete-Cement Age Publishing Company," to act as advisory editor of the leading technical journal "Concrete" and to officiate continuously for more than two score years as a leader in scientific and engineering association work. He also studied law, was admitted to the bar in 1879, and for a number of years represented the Pennsylvania Railroad and other important corporations.



Robert Whitman Lesley at the age of fourteen, after a year at the University of Pennsylvania, left college to go into business. He is still active and interested in many enterprises at the age of sixty-eight, after fifty-four years of unusual accomplishment. In addition to the many great industrial developments for which he has been primarily responsible, and which are mentioned in this interview, he is past president of the Portland Cement Association, past vice-president of the American Society for Testing Materials, member of the Engineering Societies' Joint Committee on Concrete and Reinforced Concrete, member of the American Society for Testing Materials Committee on Cement Specifications, member of the American Chemical Society and the British Chemical Society, presiding officer Cement Section of International Congress of the Association for Testing Materials, New York, 1912, former member of the United States Advisory Board on Fuels and Structural Materials, appointed by President Roosevelt; honorary member of the Portland Cement Association; member of the Philadelphia Chamber of Commerce, manager of the Franklin Institute and founder and consulting editor of "Concrete-Cement Age." He is perhaps best known as one of the principal founders of the American Portland Cement Industry.

Mr. Lesley modestly claims that he has been literally pitchforked into the various undertakings that have distinguished his career, and he cites a very interesting account of the way in which he has become interested in cement. In those early days he was associated with the Philadelphia Public Ledger as assistant editor. His uncle, one of the pioneers in the natural cement business who had a small plant in Cumberland, Maryland, thought that some of his product might possibly be disposed of in Philadelphia. He asked his nephew, Bob, whether he thought he could sell cement, and Mr. Lesley thinking that it was the sort of cement that came in little glass bottles and stuck small pieces of wood or metal together, said he thought he could. Some weeks later, he was exceedingly surprised and perplexed at receiving a freight bill consigning to him several hundred barrels of a material about the property of which he knew nothing. He brushed up on the subject, however, from all the available sources and finding that cement was "good for bridges," managed to get in touch with a contractor who was about to build a bridge in Philadelphia. One result of his interview was that it firmly embarked Mr. Lesley in the cement business.

In those early days, in the seventies, Portland cement, the artificial product as distinguished from the natural cement then in use, was a high-priced material imported from England or Germany, and had a restricted use, principally in sidewalks and similar work. When specified for engineering work the brand or country of origin was usually named and as the cost of the cement used was small to the total cost of a great piece of work, it was a difficult matter for the pioneer American manufacturer to get a foot-hold for his material against the conservative viewpoint of the great engineers of the period. To combat this well justified prejudice was no child's play or easy task and two things were required. First, that the early day American manufacturer should actually produce a Portland cement which under all chemical and physical tests would be equal, if not superior, to the old and well-known foreign brands and, second, that the leaders of the engineering profession should by demonstration and argument be convinced of the fact beyond a doubt. It was by fulfilling these two requirements by the pioneers in this great industry that American Portland cement was made a standard article of engineering and architectural practice.

It required the arguments of a lawyer to convince engineers and public officials that American Portland could be used

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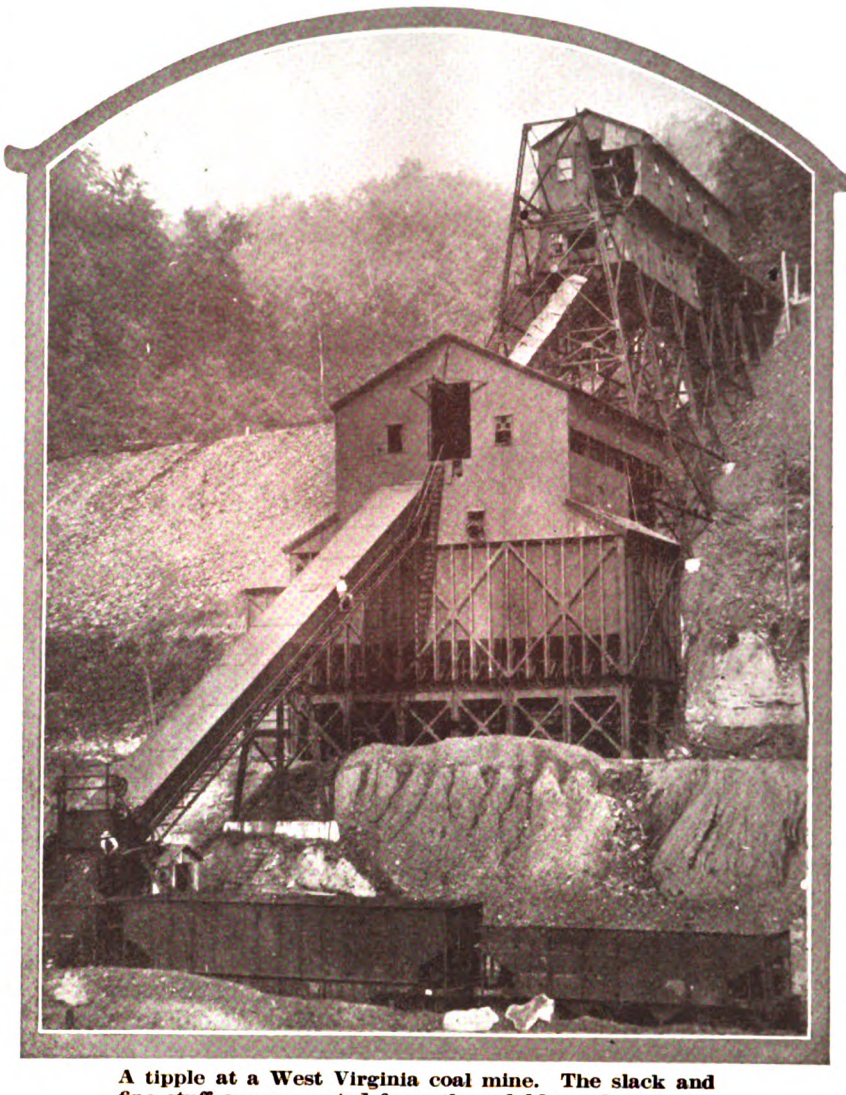
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Bituminous Coal—the Basis of Modern Civilization

By Reginald Gordon

FLOYD W. PARSONS, in *World's Work,* August, 1921, said: "Coal is not only the foundation of America's industrial life; it is also the base on which civilization is built." Bearing on another phase of the subject of coal, Herbert Hoover recently stated that the coal industry is "the worst functioning industry in the Country." The average householder, in the East at any rate, is usually concerned with the supply and cost of anthracite. But take the United States and Canada as a whole, it is bitumious coal, preëminently, that concerns everyone, whether he knows it or not. Fuel for factories, for for public utility stations, for railroads and for steamships is soft coal, bituminous. In this statement, we do not lose sight of the fact that in certain sections of the country, oil is the fuel almost exclusively employed.

There is immense potential energy in bituminous coal. Anyone accustomed to burning anthracite, finds he has an entirely different job on his hands if he undertakes to fire "soft," or bituminous under a boiler; or even in a domestic heater or stove. The stuff smokes all the time; burns up quickly, or "cakes" together. A furnace adapted to hard coal will not burn soft coal so efficiently, because the large quantity of volatile hydrocarbons in the latter must have air above the fire in order to burn properly. So, complete combustion of any grade of bituminous coal involves a certain type of furnace and grates as well as proper regulation of the draft, particularly the admission of the correct amount of air above the fire.



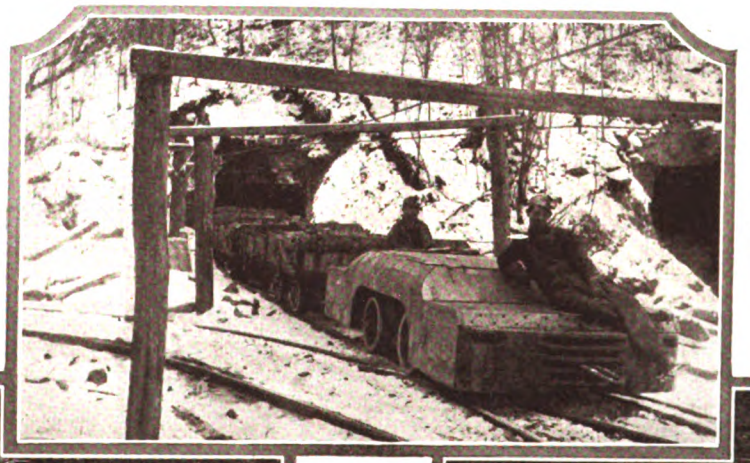
A tipple at a West Virginia coal mine. The slack and fine stuff are separated from the salable coal, which is loaded through the chute into railroad cars.

Bituminous coal is widely distributed over the North American Continent. Occurring usually in geological formations that are somewhat more recent than those wherein anthracite is found, bituminous in many grades and degrees of softness is mined in twenty-five states. It has been broadly classified as:

Peat
Lignite
Sub-bituminous
Bituminous
Semi-bituminous.

The first of these, peat, is not used for fuel in the United States. It is a soft, dark brown or black substance found in swamps and marshy lands directly under a layer of coarse grass, moss and roots. We were formerly so abundantly supplied with wood and good coal that we have never faced the necessity of digging and drying peat, as have the

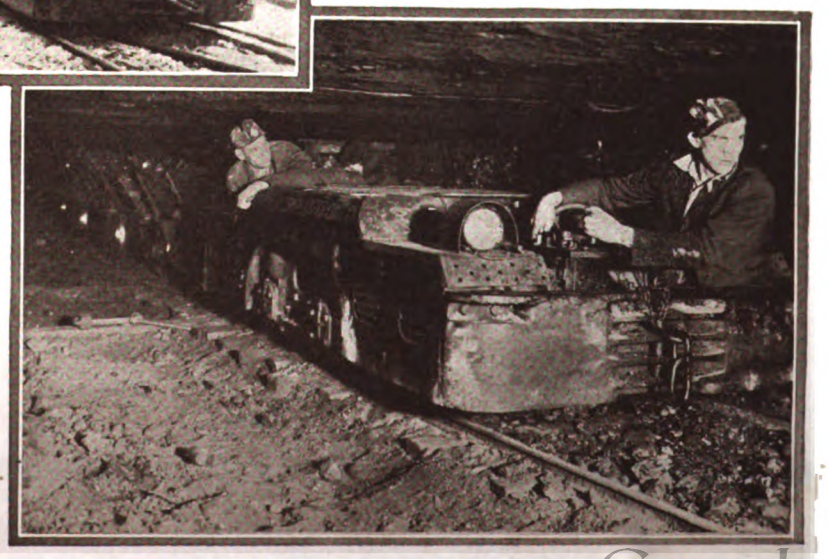
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Six-ton armored tank locomotive hauling a train of loaded mine cars from the mine to the tipple.



Cutting into a thick vein of coal in an Alabama mine.



Another view of a mine locomotive. It's a case of "low bridge" in this mine.

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Congestion—a scene in almost any large railroad yard when business is booming and a coal shortage occurs.

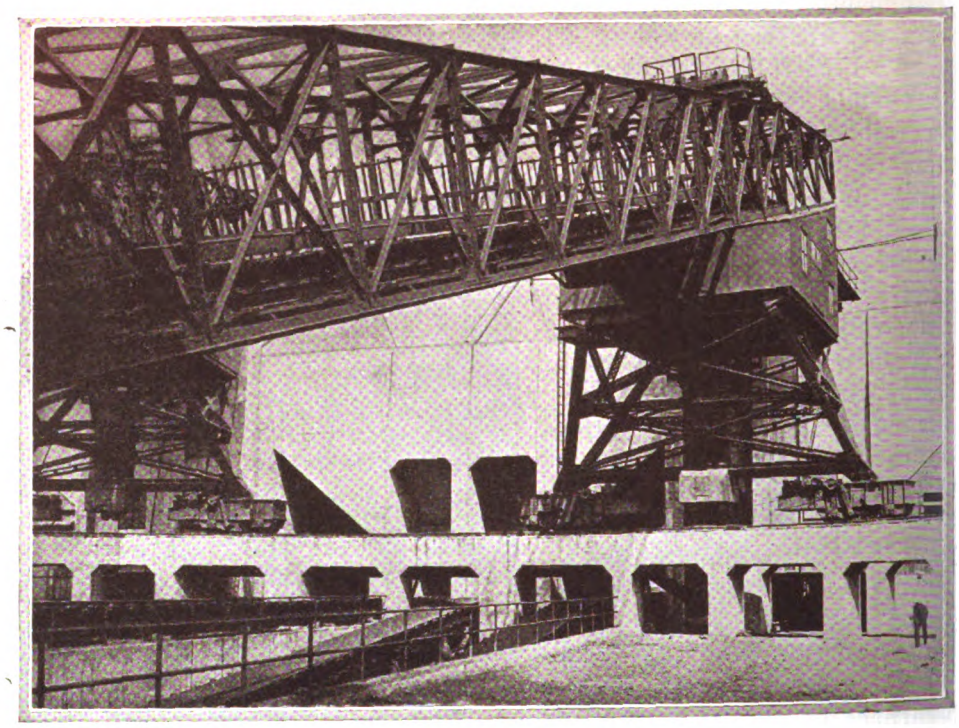




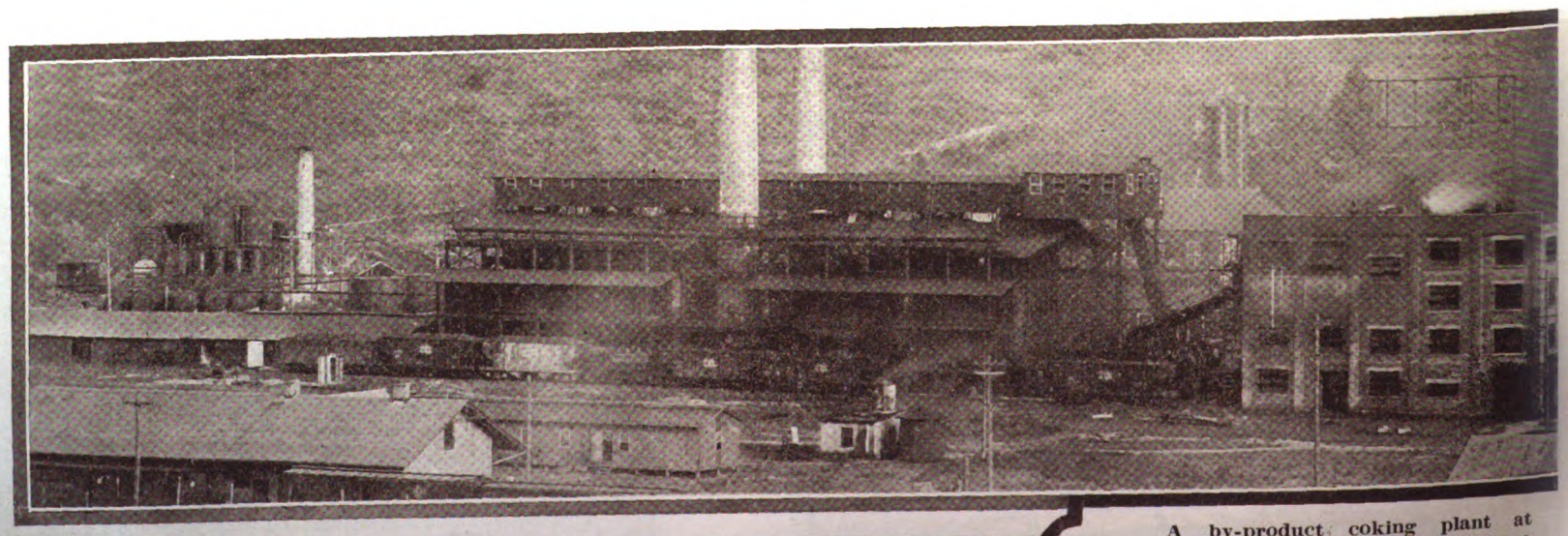
Sampling a car load of coal. The inspector will turn it over to the purchaser's chemist to determine its fuel value.



Putting a loaded mine car on the "cage" of a hoist, which will lift it to the surface, many feet above.

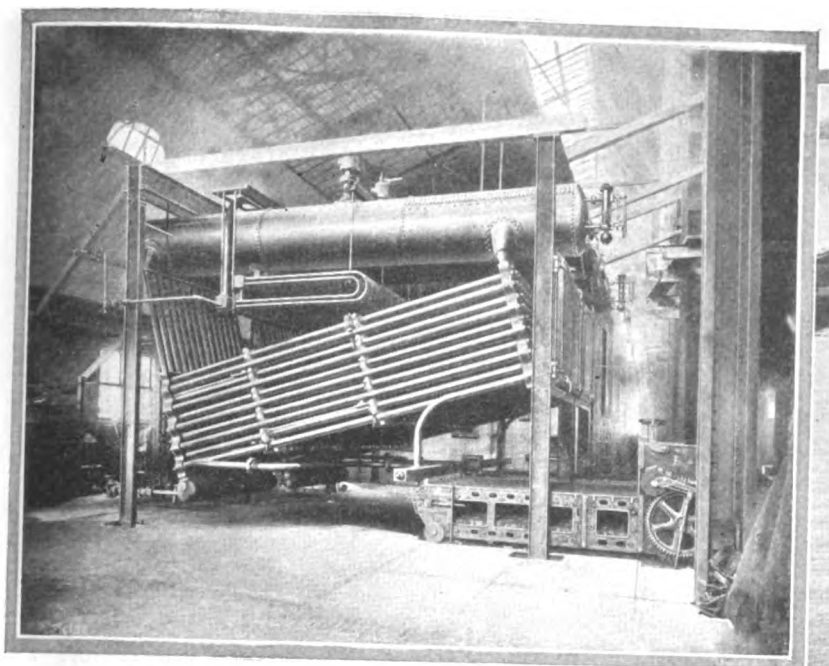


A movable coal conveyor at Baltimore for transferring coal from railroad cars to vessels.



A by-product coking plant at Clinchfield, Va. Coking ovens are

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Babcock & Wilcox travelling-grate stoker. Enclosing brick walls omitted so as to show position under boiler. Coal moves from right to left.

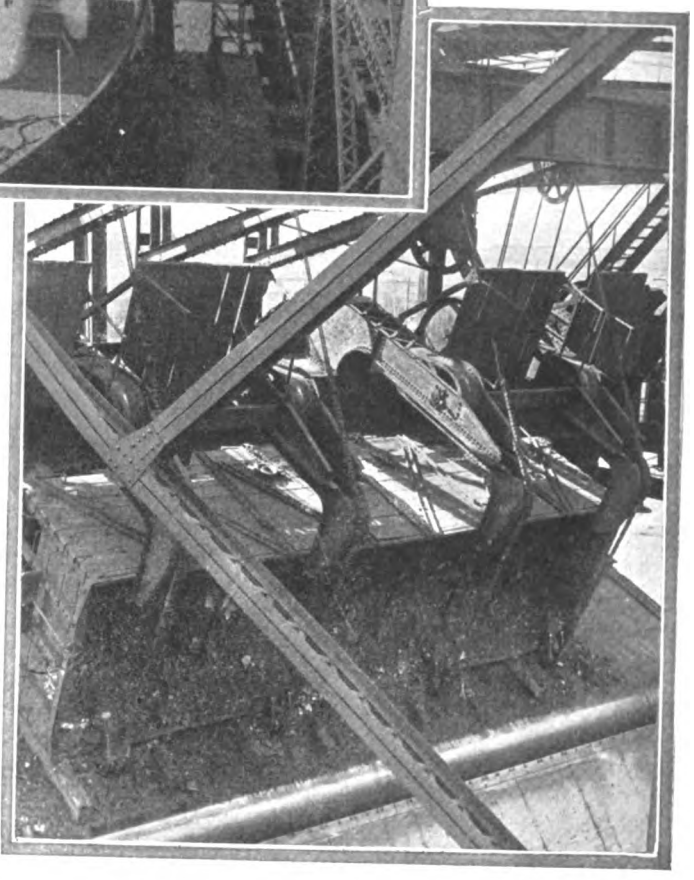


Coaling a steamer by dumping fuel through the inclined chutes into the ship's bunkers.

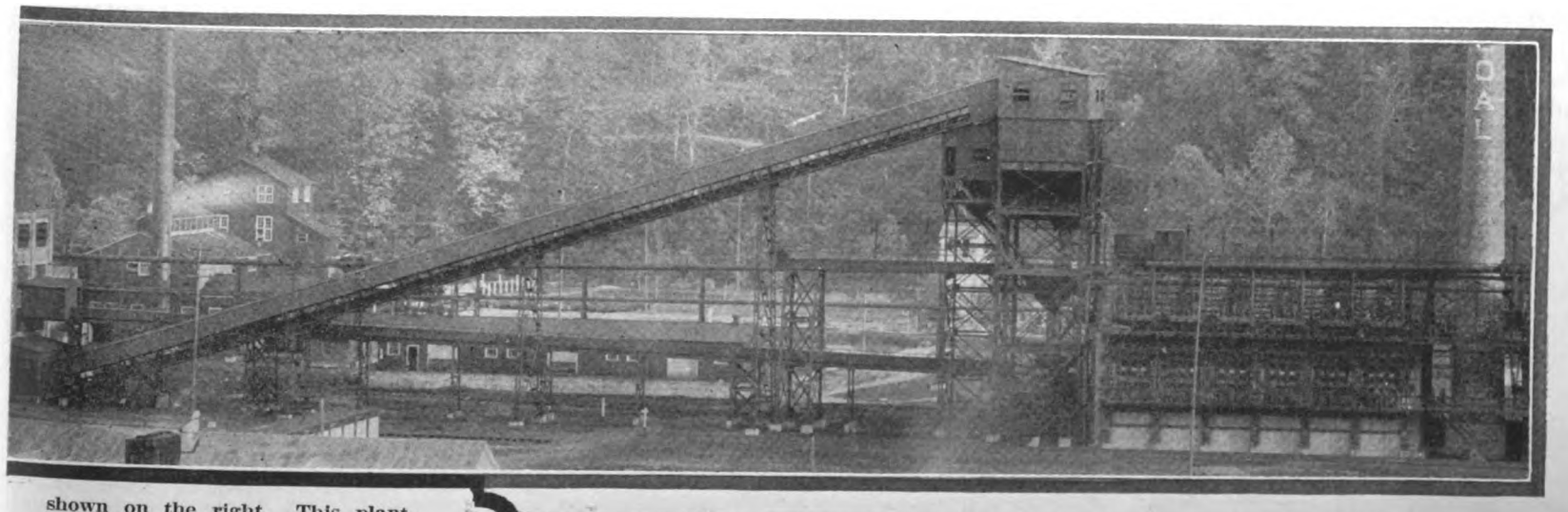
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An incline up which loaded mine cars are hauled to the tipple. H. C. Frick Coke Co.



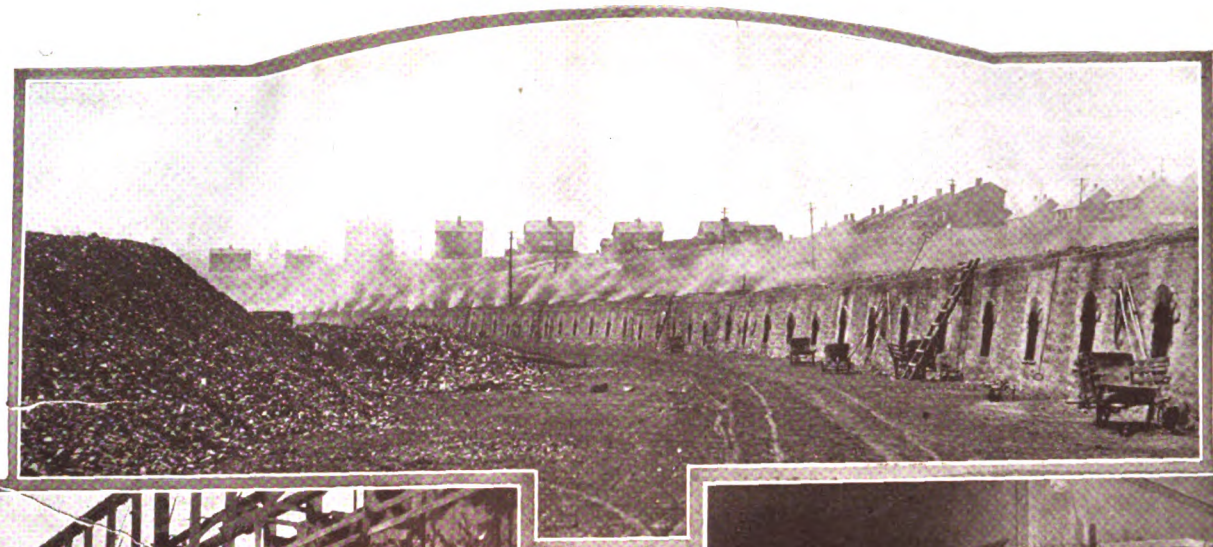
Emptying an entire car load of coal by means of a mechanical dumper located on the pier shown above.

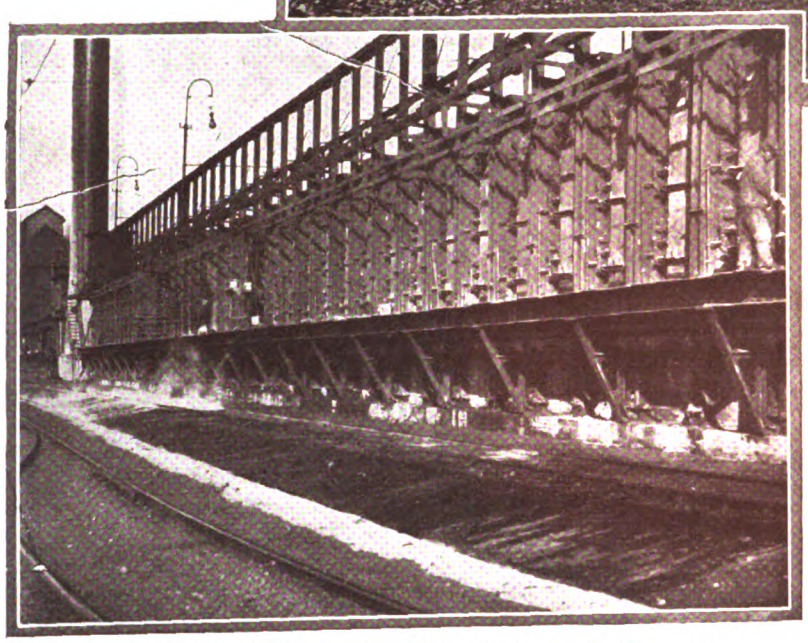


shown on the right. This plant makes coke briquettes.

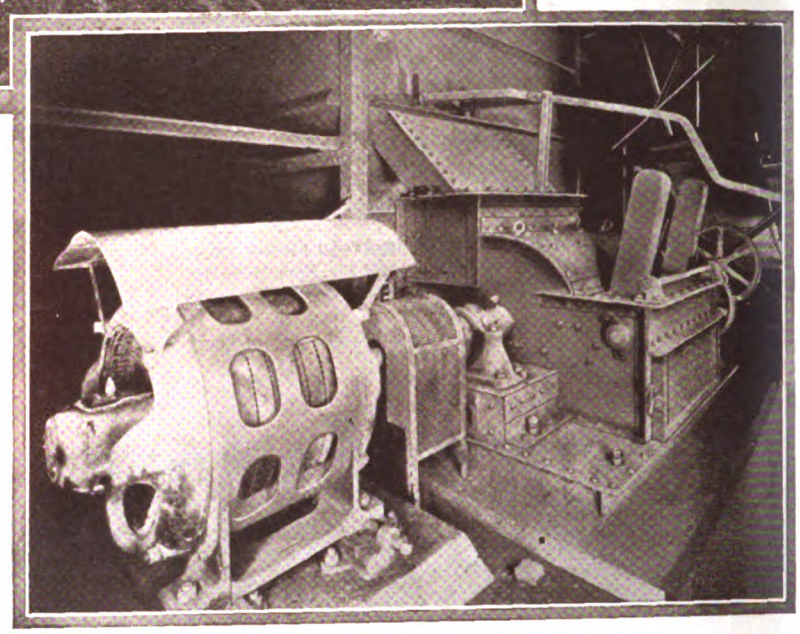
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A group of beehive coke ovens. The smoke shown at the top of each oven is wasted. The by-product oven conserves all this. See text for description of process.





One end of a group of by-product ovens in a large coking plant.



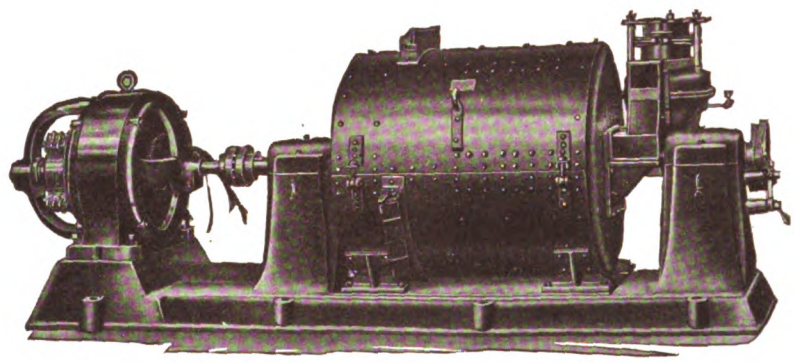
A motor-driven coal crusher and pulverizer for reducing coal to powdered form.

(Continued from Page 19)

inhabitants of so many foreign countries.

In North Dakota and Eastern Montana are extensive deposits of lignite, also called "brown coal," easily mined, but brittle and disintegrating easily on exposure to the weather, and having a fixed carbon content of only from 27 to 32 per cent. It is used to a considerable extent in the West, but for general purposes is inferior to bituminous coal.

In the Dominion of Canada, the coal deposits are in the extreme eastern part, and in the western provinces. In Ontario and Quebec, the chief centers of population, a large amount of coal is imported from Pennsylvania and Ohio. In 1920, Canada produced 16,631,954 tons of coal, an *increase* of 21.6 per cent over the output in 1919. The figures of output are significant to us on this side of the international border when it is noted that Canada's imports of coal from the United States in 1920 totalled 16,220,880 tons.

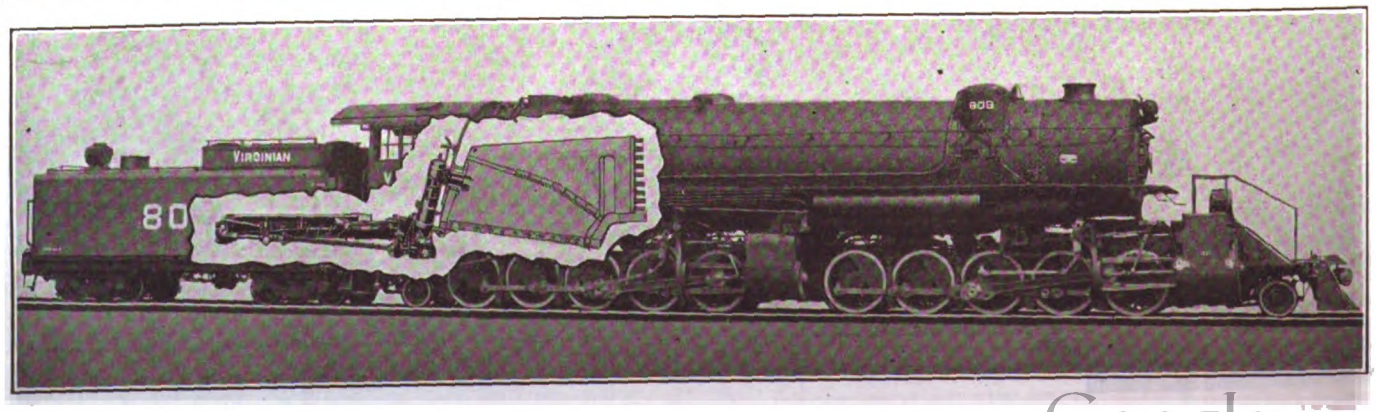


Another coal crusher and pulverizer. These machines are placed close to the boiler front or kiln.

General arrangement of mechanical stoker applied to the largest and most powerful locomotive in the world. This stoker does the work of three firemen.

In general, as compared with anthracite, bituminous is easily mined. Many of the deposits are reached by tunneling into a hillside, while others must be reached through deep shafts, from which lateral tunnels are driven in those rock strata where coal seams occur. Nor is there any very extended preparation required after coal is taken from the mine. The larger lumps break up quite freely when loaded or dumped, and taking advantage

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Better Refrigeration for Perishable Shipments

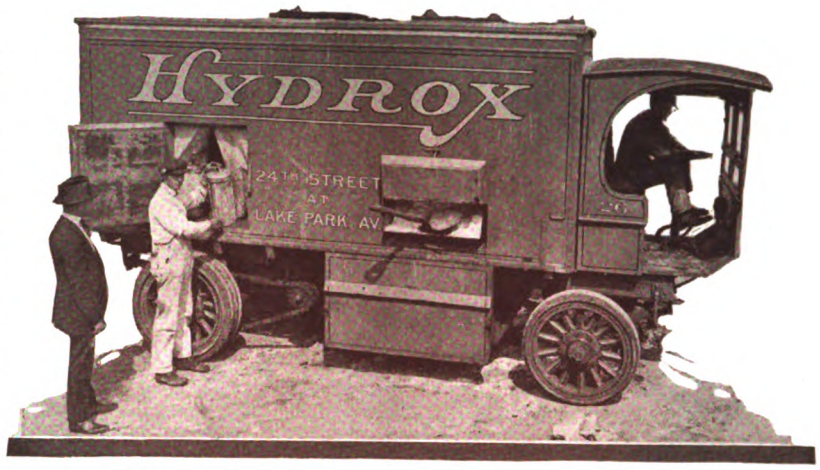
By Robert H. Moulton

IT seems probable that the present railroad transit refrigeration system in this country will undergo a decided transformation in the near future as the result of the introduction recently of an entirely new system of cooling and heating cars. Not only that, but the system is equally applicable to other vehicles such as boats and motor trucks, carrying perishable products over long and short hauls. The system is based on the automatic circulation of brine throughout the carrier and, while simple enough in construction and operation, possesses so many points of superiority over all other methods now in use that it has already been adopted by one of the big five packing houses as their standard system of transit refrigeration.

A series of tests made under varying conditions and covering a period of two years were conducted for the purpose of perfecting the mechanical details and ascertaining the exact amount of absorption surface needed to safely and efficiently meet all requirements. These tests were generally successful, and even during the early states of experimentation, when tests had to be conducted without the aid of any previously obtained data, the results were so extraordinary as to attract general attention among railroad men and shippers.

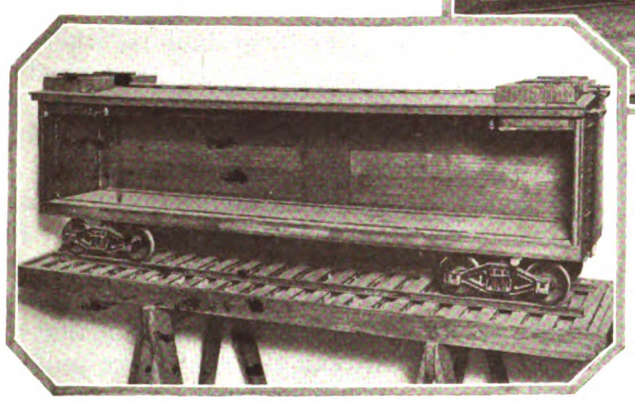
The principle of the thermos bottle has been applied to the automatic brine circulation system by heavily insulating its vital parts from the rest of the vehicle. Briefly, the system consists of a tank, or two tanks connected by a series of pipes running along the top of the car, the pipes only being exposed. In each tank, which is filled with a mixture of ice and salt to form brine, is a partition running lengthwise of the car; in one of these partitions are four check valves opening to the right, and in the other four similar valves opening to the left. The result is that when the car in transit is swayed or jolted over to one side, the brine sloshes through to that side; when it is jolted the other way, the valves on

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The new system is adapted to boats and trucks as well as to R. R. cars. On this ice cream truck the brine tank occupies a space in the top of the truck.

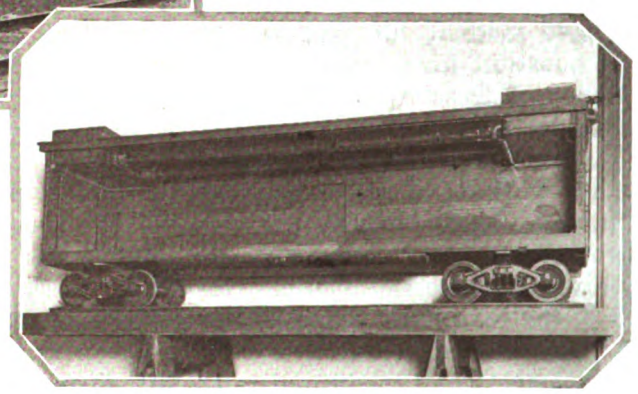




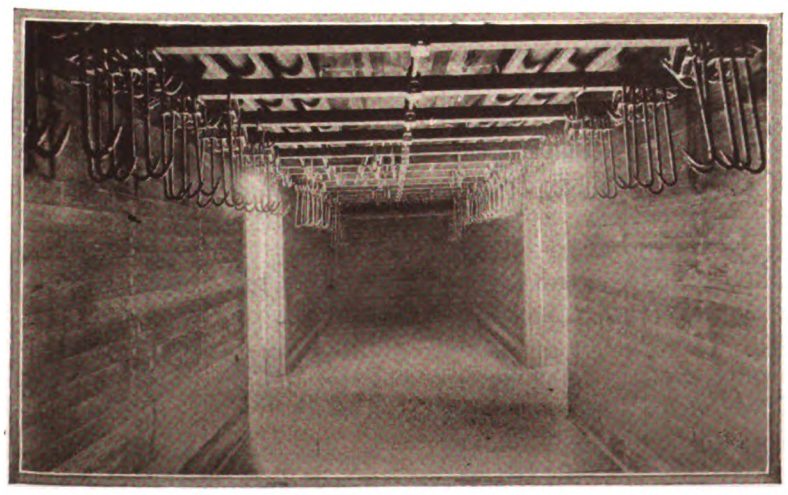
Interior of meat car, showing pipes overhead. Space at end of car taken up by ordinary method of refrigeration is all saved by having brine tanks on roof of car.

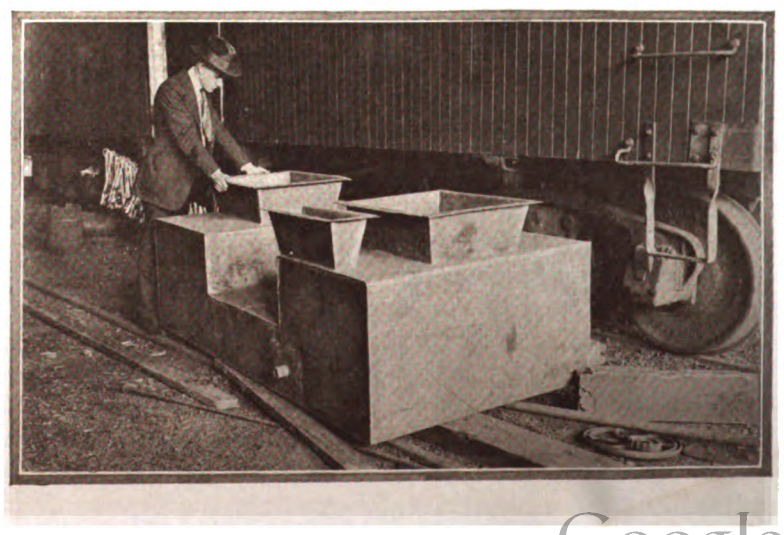
Above—meat car equipped with the new system of refrigeration.

On floor of car at the left are shown the pipes used for heating purposes when car is passing through very low outside temperatures. At the right is shown the arrangement of brine tanks and overhead pipes for refrigerating.



Details of one of the brine tanks for use on freight cars. These tanks are shown installed on the cars in the illustration at the center of the page.





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Bituminous Coal—The Basis of Modern Civilization

(*Continued from Page 22*)

of this quality, it is quite usual to crush soft coal to a more or less uniform size when it is to be fed to mechanical stokers in boiler rooms, as it then burns more evenly and gives out its heat more readily.

As has been the case with all our natural resources, we have always been wasteful with coal—wasteful in mining, in methods of distribution and in utilization. Bituminous, being generally more easily mined than anthracite, the best of it has been stripped from the mines, leaving a large quantity of less valuable coal; but which, owing to hap-hazard methods of mining, is not usually available after a lapse of time when the workings have made much further progress. While coal fields are of large extent and not dangerously near the exhaustion point, the coal is continuously becoming more difficult and costly to get out of the earth and unless we at once take steps to mine, transport and use it more efficiently, the next generation will face a real coal shortage.

With scientific management applied to mining, transportation and utilization of coal, we should have enough, in the opinion of the many experts who have studied all phases of the question, for a long time to come. Excessive competition has led to the development and operation of many mines that are working at great disadvantage. Uncertainties and irregularities in the shipment of their output lead to fluctuations of the coal market, unsettled labor conditions and economic waste. If all the bituminous mines in the United States were working on full time, they could produce from 18 to 20 million tons per week, equivalent to 1,040,000,000 tons a year. In the year 1918, almost 680,000,000 tons were produced; but as our average annual consumption is only a little more than 500,000,000 tons, it is evident that there is plenty of coal in the ground for our needs, and the quantity that can be mined is much greater than the amount that can be transported to market. In other words, we have an excess of productiive capacity that ties up money, men and machinery. The report of the Committee on Elimination of Wastes in Industry disclosed the fact that bituminous coal miners, during the average year work 213 out of a possible 306 days; a waste of man power of 93 days, which soon totals up to a large sum. There are many reasons for this idleness. Among them is the fact that in a busy period, when all available coal cars are in use, it is impossible to provide such a supply of cars at every mine as will carry away the output as fast as it is mined. So when we undertake to ship over 13 million tons of coal a week, the railroads, being congested with other traffic at such times, cannot keep the coal trains, both loaded and empty, moving fast enough and a traffic jam results, causing a coal shortage. This usually happens during a rapid resumption of business and manufacturing activity, when most large consumers, after pulling through a dull period by buying coal only for immediate needs, rush into the market in a frantic effort to get coal—all they can buy—for immediate delivery.

In connection with the subjection of waste, it is significant to remember the figures given in an estimate recently made by the U. S. Bureau of Mines. Put briefly, it is, that of the average ton of coal (2,000 lbs.) as commonly used in a steam plant, 600 lbs. are lost or wasted in mining alone, 126 lbs. are consumed between mine and boiler room, 446 lbs. go up the stack in the form of waste gases, 102 lbs. are lost by radiation and in the ash pit, 650 lbs. disappear in the process of converting the heat energy into mechanical energy and *only 76 lbs.* are left for application to useful work. Truly a startling result! Better means must be found for utilizing the energy in a ton of coal, no matter how much we improve the methods of marketing and shipment.

Improved machinery is coming into use for mining and getting out coal. Even with the best equipment, miners work under many disadvantages and coal mining is a dangerous occupation. Underground, with the liability of death from rock falls and careless blasting, the miners also face the danger of explosion of the gas which occurs in considerable quantity in certain localities. It is chiefly marsh gas, (methane, Ch_4), called also fire damp. The explosions due to accidental ignition of this gas take a large toll of life every year.

Machines for cutting and loading coal, usually operated by compressed air are widely used. Storage battery electric locomotives, as well as those taking power from an overhead conductor are employed to pull the mine cars in and out of the workings. It is interesting to note, too, that British miners will have none of these aids to production; using only hand tools, pick, shovel and crow bar for digging out coal and usually employing mules to haul the mine cars.

In the Eastern states, where anthracite is used in many industrial plants and universally as domestic fuel, people hardly realize the extent to which the remainder of the United States is dependent upon bituminous coal. The objectionable features of the use of such feul, the dense black smoke and the quantity of fine soot constantly in the air have impelled local authorities to take measures to compel the adoption of means for reducing the smoke discharged from factory and locomotive stacks, within the limits of large cities. Through the education and training of firemen and by means of devices that facilitate more uniform and more complete combustion, much has been accomplished toward this end. At present, engineers are concentrating their energies on reduction of waste in handling coal and on utilizing the heat of combustion to greater advantage.

In addition to its wide use for industrial purposes, bituminous coal is the fuel burned by about 90 per cent. of the locomotives on American railroads. While there are many equipped for burning oil, and a number that burn anthracite on the roads that tap the Pennsylvania hard coal regions, bituminous coal is *the* locomotive fuel. And just here also comes a source of waste. Every stack that throws out black smoke carries off a part of the potential energy of the coal, and, as in the case of a locomotive, this is very difficult to suppress entirely, a promising vision of the savings effected by the general electrification of the railroads is opened up. In spite of the hideous waste referred to earlier in this article, a ton of coal burned on the grate of a stationary power plant boiler gives more energy in the form of electricity on a third rail or an overhead conductor than when burned in the firebox of a locomotive.

In another respect, too, we waste human energy, as well as coal by reason of the indiscriminate shipment and use of coal. Coal must be transported from mines to railroad division points for use on locomotives. This haul involves the use of valuable rolling stock and motive power as well as the services of many men, drawing a high rate of wages. The coal having been delivered, the process must be repeated in the reverse order and the empty cars hauled back to the mines. This is true of industrial coal as well as of that for railroad use. About 30 per cent of all our railroad freight consists of coal.

For large boilers, where the amount of coal that must be fired is greater than the strength and experience of a fireman can successfully accomplish, mechanical stokers have been developed that feed coal to the grates not only in larger quantities than can be supplied by hand, but that also spread the coal more uniformly. Their operation can be increased or diminished in accordance with the demand for steam; and one man, after suitable training can take care of several mechanicly stoked boilers more efficiently than several men struggling to keep up the steam pressure when the big power load comes on. These stoker machines are of many types. In some, the coal is pushed forward over the grates, while in others the grates are constructed like a number of endless chains and continuously move forward as the coal is fed on them from

(*Continued on Page 26*)

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New Plant of Yawman & Erbe Manufacturing Company

Rochester, New York — *Smith, Hutchinson & Grylls, Architects*

And YAWMAN & ERBE said: "Let WHITE build it of CONCRETE"

Up-and-going manufacturers throughout the land are enlarging and modernizing their plants to meet every kind of competition, domestic as well as foreign. The new Yawman & Erbe plant, which we recently completed, is typical of the up-to-the-minute construction that characterizes *White* buildings.

Benefit by our long experience erecting buildings for the foremost corporations. We can serve you equally well wherever you plan to build.

Send for actual photographs of recent *White—constructed* buildings.

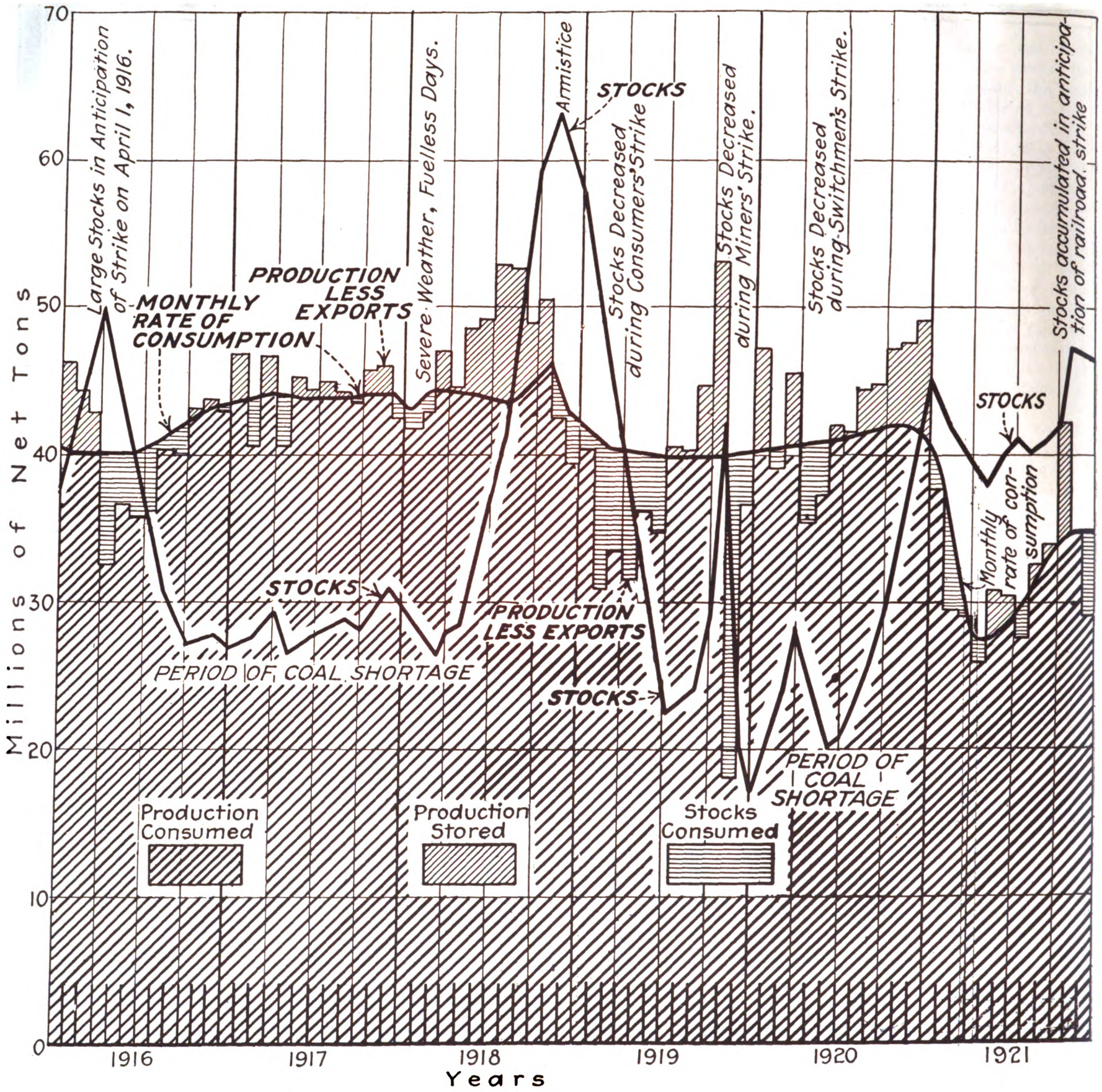
CONCRETE WHITE CONSTRUCTION CO. INC. NEW YORK

WHITE CONSTRUCTION CO., INC.

95 MADISON AVE., NEW YORK, N.Y.

CONCRETE WHITE CONSTRUCTION CO. INC. NEW YORK

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This diagram, reproduced by permission from COAL AGE, shows the relation of available production, consumption and stocks of bituminous coal in the U. S. during the period 1916-1921

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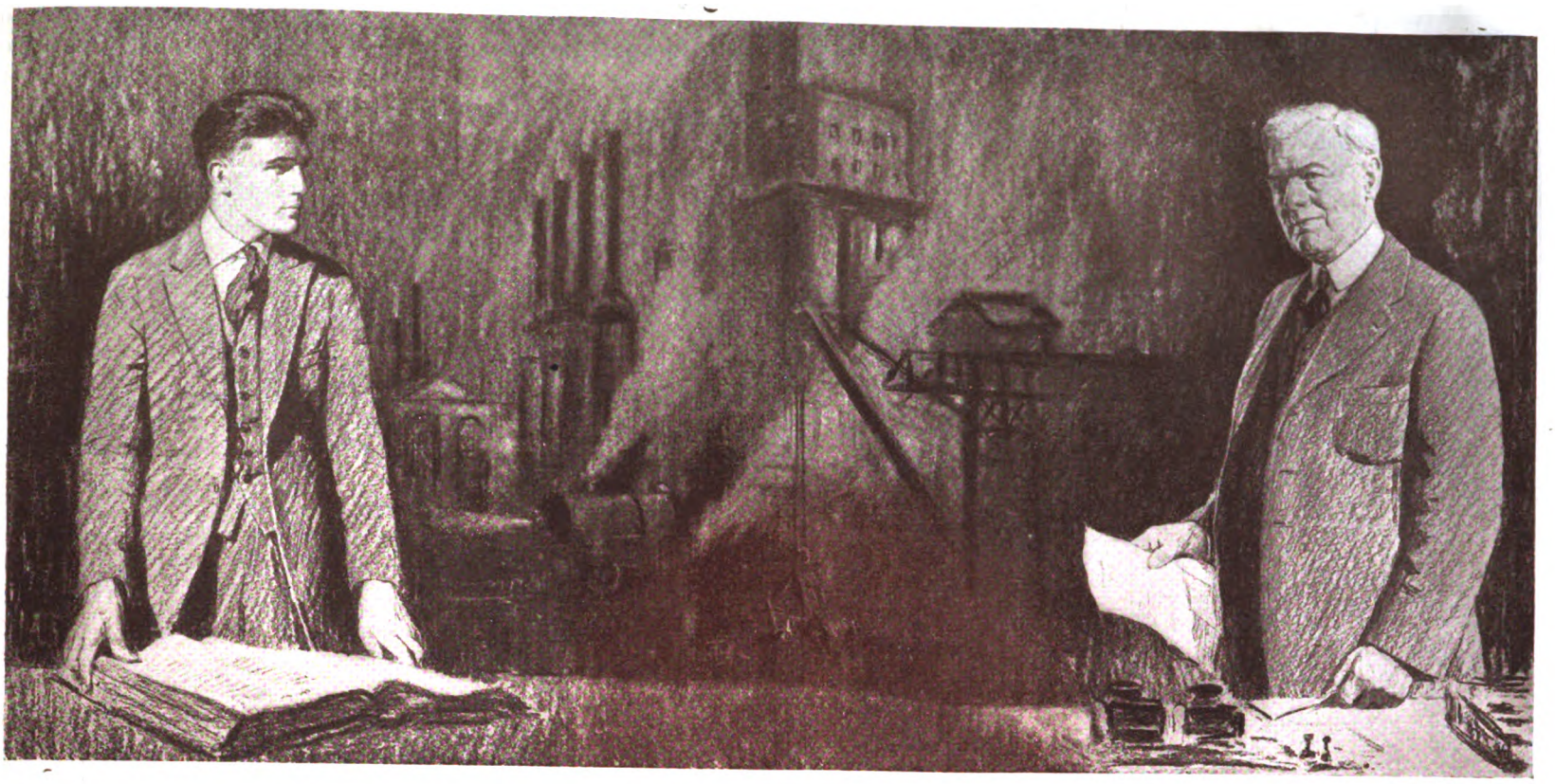
hoppers placed on the front of the boiler. All large power stations are now equipped with some form of mechanical stoker and to their use is due a part of the high degree of efficiency and economy of fuel attained in such plants.

For another reason, but with equally good results, mechanical stokers have been applied to more than 4,500 large locomotives, chiefly in freight service. The constantly increasing size and power of locomotives made it evident, some years ago, that some device must be employed to do the work of firing such engines, which, when developing full power, consume from 7,000 to 10,000 lbs. of coal per hour. Experience demonstrated that only the strongest and most robust firemen could throw more than 5,000 lbs. of coal per hour into a locomotive firebox for several hours continously. The locomotive stokers consist of a small steam engine placed under the cab deck operating a conveyor that brings the coal to a crusher which grinds it to proper size, and from which it is fed through a suitable conveyor to openings or nozzles from which, assisted by small jets of steam, the coal is sprayed into the firebox. The machine is so adjusted that coal is spread evenly over the grates and the quantity fed is entirely under the control of the fireman.

There are so many grades of soft coal shipped from the mines that large consumers are obliged to make tests at frequent intervals for the purpose of determining the quality of what they buy. It is quite usual to take a sample of coal from every car received and subject it to analysis from which the percentage of fixed carbon, the amount of volatile hydro-carbon substances and the sulphur, ash and quantity

(Continued on Page 28)

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The youngest man enrolled yesterday is 22 and bookkeeper in a Trust Company

The oldest man enrolled yesterday is 60 and Treasurer of a successful corporation

One is 22—the other 60

Both Enrolled in the Alexander Hamilton Institute the Same Day

IN salary, in age, and income there is a business man whose business situation is almost precisely like yours.

Yesterday that man enrolled for the Modern Business Course and Service of the Alexander Hamilton Institute; every day men like you are enrolling; and in that way are shortening their path to increased income and business success.

A single day's enrolments

One day's mail brought in enrolments representing youth and middle age, and all degrees of position and salary. Glance at the two pictures at the top. One represents the youngest man enrolled that day in the Institute—alive, alert, twenty-two years old and determined to be *something* and *somewhere* at thirty.

The other is the oldest man enrolled that day—treasurer of a corporation, giving satisfaction to his directors but not satisfied with himself. He has determined to know the essentials of the *other* departments of business as well as his own.

That same day 611 men asked for fuller information about the Alexander Hamilton Institute by clipping a coupon like the one below. Can you afford to let these 611 men secure a business advantage over you? Isn't it worth while to make the little effort required to clip the coupon and get the facts?

Just what will the Institute do for me?

This is what the Institute does! By texts and lectures prepared by business leaders, by practical business problems, and personal guidance it gives you the principles and practices of each department of modern business.

It takes the practical experience that you have in one department and adds to it the working knowledge of all the other departments to fit you, as an executive, to understand and direct the work of men in those departments.

Practical experience alone, taking you from one department to another, would give you that training *in years;* the Alexander Hamilton Institute offers it to you *in months.* And the record of the men it has enrolled is evidence that its training *does* train.

You are paying whether you accept or not

The cost of the Modern Business Course and Service is a little investment in money and time. But think of the price which those men pay who do not secure business training.

Think of the years of routine progress or petty salary increases when the progress might be rapid and sure. Think of the opportunities that pass by because men have not the knowledge and self-confidence to reach out and grasp them.

Six hundred and eleven men wrote in one day for the facts. Will you invest a two-cent stamp in your future as these men did in theirs?

Send for this book

All the facts about the Modern Business Course and Service and the answers to every question you are likely to ask are contained in a 120-page book "Forging Ahead in Business." It is a valuable addition to any business library, yet you can read it in a single evening. A copy will reach you entirely without obligation on receipt of your name and address; merely fill in the coupon and mail.

Alexander Hamilton Institute
412 Astor Place, New York City

Send me "Forging Ahead in Business" which I may keep without obligation.

Name.....
Print here

Business Address.....

.....

Business Position.....

Canadian Address, C.P.R. Building, Toronto; Australian Address, 42 Hunter Street, Sydney

Copyright, 1922, Alexander Hamilton Institute

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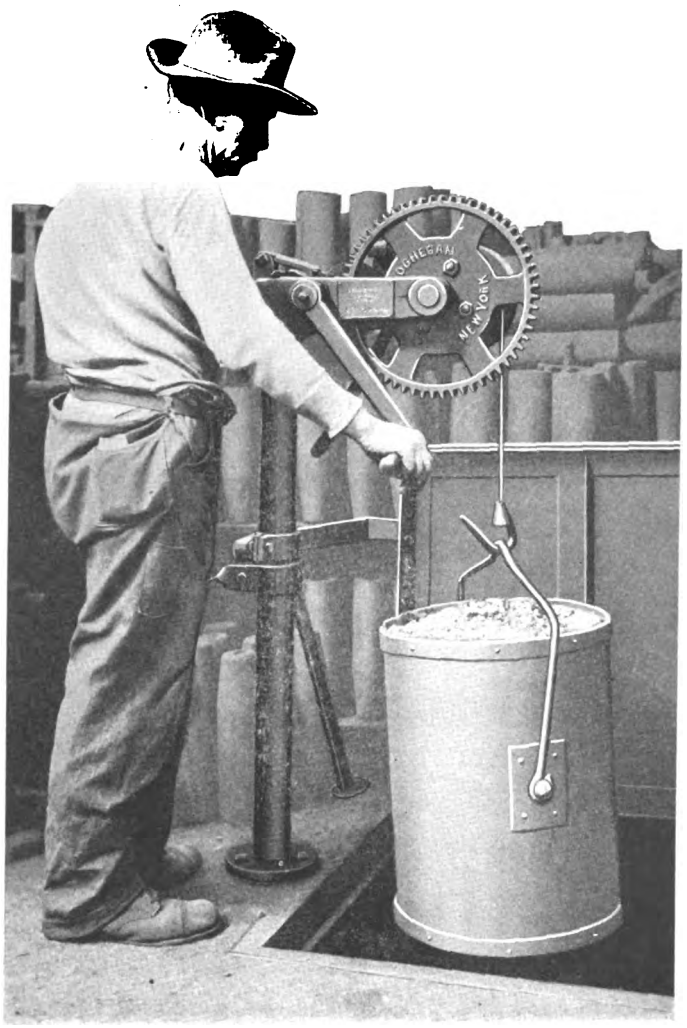
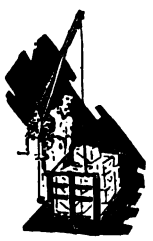


Photo Illustration of Model A Non-Telescopic Hoist in use at the Packard Motor Car Company's Plant, Detroit, Mich. Three other G&G Hoists are in use at this plant for handling light loads.

Raises Electrically or Manually Lowers by Gravity—



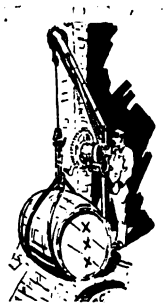
THE use of heavy oversize hoisting apparatus for loads up to 1000 lbs. means time lost in handling and money wasted. And the "rope and pulley" method is a makeshift —and *unsafe.*



Five Models of the G&G Hoist to choose from—operating by hand or electric motor—with or without overhead crane—telescopic or non-telescopic.



Tell us what you have to lift and lower—what your floor conditions are—and we will recommend the proper G&G Hoist to fit the job.



New booklet upon request

GILLIS & GEOGHEGAN

556 West Broadway - - New York

The G&G REG. U.S. PAT. OFF. Telescopic Hoist with Automatic Gear Shifting Brake Device and Silencer

(Continued from Page 26)

of moisture in the sample are ascertained. Many steam plants use a mixture of fine anthracite and bituminous with satistfactory results, but this kind of fuel requires special grates and draft arrangements.

Pulverized coal is a valuable fuel, giving a very hot flame of uniform combustion and making practically no ash, but rather a thick, vitreous slag. A constantly widening field of use is opening up for pulverized coal, not only for use under steam boilers, but also for cement kilns and in furnaces for heating steel slabs, billets and sheets. Careful crushing, drying and pulverizing are necessary and the powdered coal is forced through nozzles by jets of air into the furnace in such manner as to consume the combustible portion of every grain.

Like other powders, such as flour, grain dust, etc., powdered coal is readily ignited in the presence of air and for this reason it is always crushed and pulverized directly before being fed to the furnace. The coal is first crushed to a size that would pass through a 1½-inch screen, then passed through a magnetic separator which picks out stray pieces of iron, called "tramp iron" that often find their way into a carload of coal. These pieces of iron would wreck the pulverizer and might cause a spark that would explode the fine coal, as has happened on more than one occasion with disastrous results. The coal is then passed through a dryer, the fine dust is drawn out by an exhaust fan and the coal passes to the pulverizing mill, thence to a blowing tank, from which compressed air forces it through a pipe line to a closed hopper and through suitable gates to the burners.

For many years, coke has been used in blast furnaces for smelting iron ore, as well as in foundry cupolas for melting iron for castings. Until recently, almost all coke was made by heating bituminous coal in ovens made of clay, and tightly closed except for a small opening at the top, to allow the escape of smoke and gas. These were called "beehive" ovens and though they produced a good quality of coke, every constituent of the coal except the fixed carbon was lost. In several European countries a different type of oven was developed, in which part of the gas escaping from the coal was utilized to generate the heat necessary for coking and almost all the remainder of the resulting products were caught and reclaimed. Sulphate of ammonia, tar, benzol and hundreds of derivations from them are available through the employment of these "by-product" ovens.

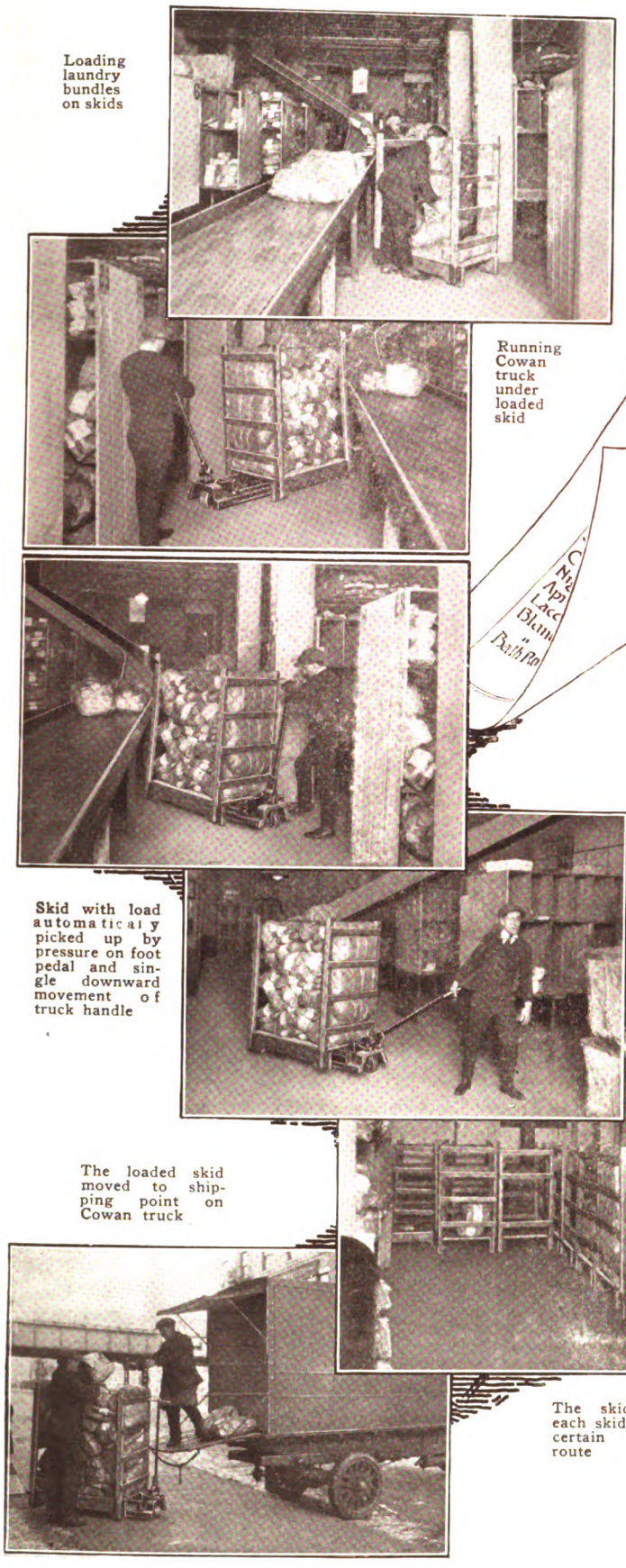
Aside from causes due to the recent business depression, not much coal is being coked in beehive ovens. The United States Geological Survey reported that since January 1, this year, up to the week ended February 4, there had been produced 577,000 tons of beehive coke. During the same period of 1921, the output amounted to 1,277,000 tons. So far, in 1922, production has been at the rate of 6,344,000 tons per annum. In the opinion of experienced coal, men, it is unlikely that last year's figures will be much exceeded in future, as the advantages of by-product ovens become more generally recognized.

The by-product industry is a fascinating story in itself, for it is the source of agricultural fertilizer, tar, explosives, road oils, drugs, dyes, perfumes, etc. Its present stage of development represents the work of highly specialized chemists and led, during the war, to the production in the United States of explosives and dye stuffs without which we would have been helpless.

Here, then, is a means of saving much of our great natural resource, coal. For, when making coke in a by-product oven, the gas given off by heating coal in the retorts is a valuable fuel, either for distribution to private consumers or for operating internal combustion engines. In other words, after coke is made and utilized for smelting iron and making steel there remains an abundant source of power for operating generators that can transmit electrical energy to distant points. Add to this the fact that the by-products of coal have a market value fully as great as the coal alone, and we have a clear indictment of the practice of burning coal in the raw state, *as coal*.

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As far in Advance of Manual Handling Methods as the Modern Steam Laundry is Ahead of the Chinaman's Wash Tub



The Through-Ticket System means just this—

(1) Unloading the goods or material from motor truck, freight car, or boat directly onto skids.

(2) The use of skids or skid containers for holding machined parts or other material passing through successive stages of manufacture.

(3) Storage on skids of goods or materials—for future use and shipment; or for seasoning purposes.

(4) The use of Cowan Self-Loading Hand or Electric Trucks for picking up, moving, and setting down the loaded skids.

The Through-Ticket System eliminates the rehandling of goods and materials as they are moved from point to point. Once on skids they are picked up, transferred, and unloaded by one man and a Cowan Self-Loading Hand or Self-Loading Electric Truck. No gang, no delay—labor saved, time saved. No stacking and restacking, loading, and unloading. No strain on laborers or damage to product.

Cowan Self-Loading Hand Trucks, Self-Loading Electric Trucks, Electric Load-Carrying Trucks, and Electric Industrial Tractors are the units of the Cowan Through-Ticket System for cutting material handling costs—used individually or in combination. Cowan Standard Steel Frame Skids, or Cowan Skids equipped with special racks or bodies, extend this system to practically every material handling need, no matter how awkward or unusual the loads may be.

Service from the start---

May we send our nearest representative to discuss your material handling problem? If you prefer, give us some idea of the conditions to be met, and we will gladly send you complete literature and information.



COWAN
Self-Loading Hand-Truck
Narrow Frame Model
Four Wheel Type

2035-N

COWAN TRUCK COMPANY
6 WATER ST., HOLYOKE, MASS.
New York Offices: Grand Central Palace Offices in Principal Cities

COWAN INDUSTRIAL TRUCKS-TRACTORS

Originators *of the* "through ticket" *system for* moving loads

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The Mechanics of the "Movie Industry"

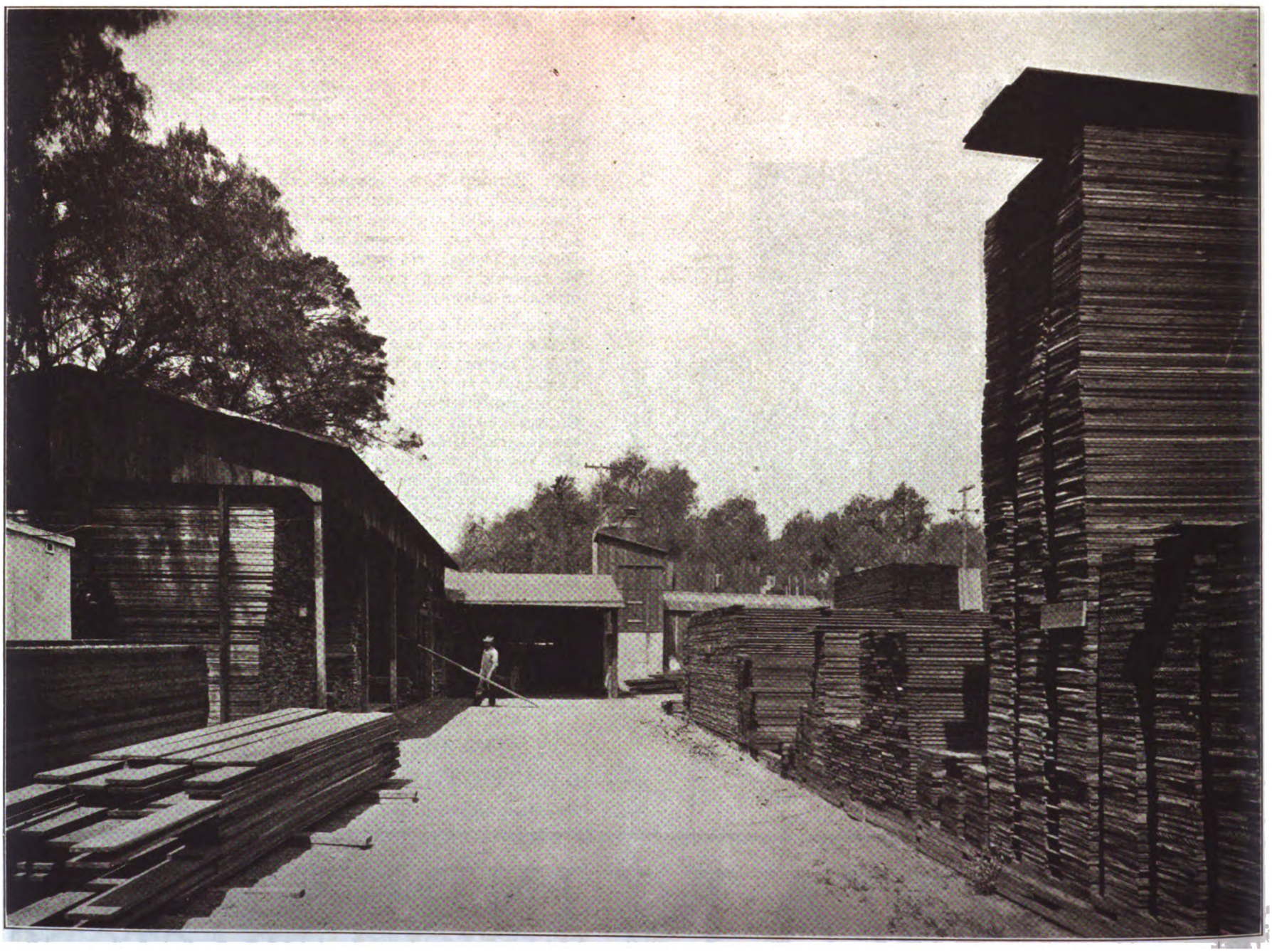
(*Continued from Page 14*)

ior scene may be laid in the tropics or in the far north; in either case, trees or shrubs must harmonize. The studio maintains a plant nursery, where a variety of shrubs and plants are propagated for just this purpose. If the scene be an interior of a cheap tenement, he must see that the wall-paper, door-casings, pictures on the walls, furniture—every last little detail of the setting and furnishings—is true to life. Again, in showing interior views of a wealthy mansion, the decorations, furniture, hangings, all must be in keeping; fine pottery, period furniture, tapestry hangings, beautifully grained panels—these things must be either real or very fine imitations, for the camera lens has a decided tendency to show up imperfections.

With this demand for accuracy, not only has the art department grown away beyond the sign-painter stage; it has had to build up a vast store of resources. Instead of working only with canvas and paint, and a few nondescript chairs, tables, and so on, the modern Art Director calls into play the services of skilled draftsmen and architects for the planning of a setting; skilled carpenters, plasterers, masons and builders for the construction; specially trained painters, paper-hangers, upholsterers, interior decorators and drapery experts for the proper "dressing" of the constructed set.

This in turn involves completely equipped carpenter shops, with up-to-date wood-working machinery; blacksmith shop, for making the necessary braces and struts, and for reproducing hand-wrought designs such as are used in old-time lamps, etc., for historical settings; a completely stocked lumber-yard, where not only soft woods are available, but where the rarer grained woods can be found when needed for a special setting; a drapery department, which is called on to furnish a wide variety of curtains, portieres and hangings, ranging from scrim curtains to finest silks and brocades; a paint department many times the size of one in a large manufacturing plant (and, contrary to the

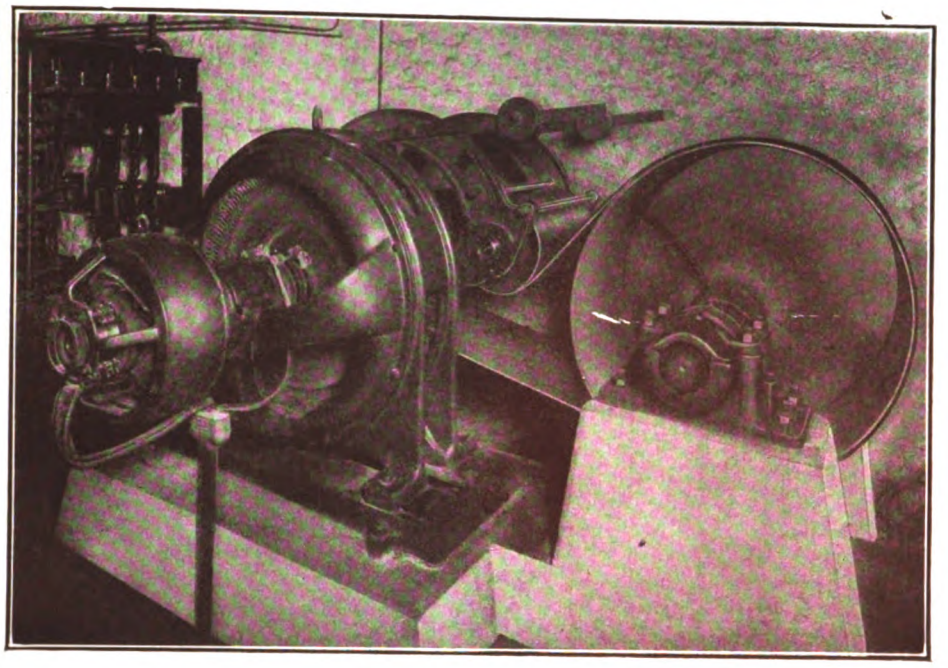
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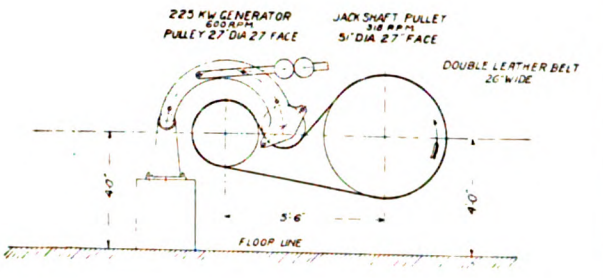


Storage yard for lumber used in making settings, Lasky Studio, Los Angeles, California

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Short Center Belt Drive





225 K.V.A. Generator Drive

Driving Pulley 51" dia., 27" Face, 318 R.P.M.

Driven Pulley 27" dia., 27" Face, 600 R.P.M.

Double Leather Belt 26" Wide.

Pulley Centers 5' 6"

In making the original layout for this 225 K.V.A. generator, the engineers were of the opinion that only a chain drive or gear drive could be used for the transmission of the 300 HP on the 5'6" centers allowed. They were surprised when we guaranteed that our

LENIX BELT DRIVE

would easily take care of their problem. Four years' satisfactory operation has proved the success of the installation.

Before you decide to abandon the flexibility, simplicity and efficiency of a belt drive, submit your problem to us. The Lenix Drive will solve it.

Our booklet "Saving Slippage and Space" describes
other interesting Lenix installations.

Ask us for it

F. L. Smidth & Co.

ENGINEERS

50 Church Street **New York, N. Y.**

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Who Will Be Responsible for the Work of the Men in Your Factory Today?

LOOK at them as they pass through the gates of your factory. Some faces are lighted with eagerness, some dull with apathy, some cheerful, some sullen—each one an individual. What force is going to weld these men into a working unit—what leadership provided that will intelligently guide them into greater production at lower costs?

The hard conditions of business today dictate that you must give more than yesterday's production for today's dollar. Economies must be studied, perhaps wage rates must be revised, and new policies must be inaugurated. It is useless, however, to make these new plans, unless at the same time you build up in your men a spirit of co-operation and understanding, guided by a leadership that insures perfect teamwork. There is but one channel through which your plans and policies can reach these men. They must be interpreted to the men in the shop by your foremen.

The Problem Your Foreman Must Meet

Your foremen are picked men, selected for their skill and their loyalty. Your foremen know your machines, your technical processes; do they know how to handle men?

Your workers are not machines; they are human beings. They have ambitions to be reckoned with, enthusiasms to be aroused, suspicions to be disarmed, and even whims to be placated. This is the test of your foremen's skill. Can they handle men as well as they handle machines? You may plan new policies, new economies, in the front offices, but it is absolutely up to your foremen to get the full and sympathetic teamwork of the men in the shop behind these policies and economies.

This is a big job—so big that many of the better plants are beginning to see that their foremen should have special help and training to meet the present situation.

How 500 Modern Plants are Training Their Foremen

Many companies realizing the need of developing the executive ability of their foremen, have sought to fill the gap by conducting regular foremen's meetings, at which the routine problems of the shop are discussed. A far better and more practical plan is to give the foremen and other key men about the plant an intensive group training in modern production methods which will develop their executive ability. Because of their success in adapting this training plan to the peculiar needs of foremen, the Business training Corporation, of New York, has been engaged to carry on this work in more than 500 leading plants, representing almost every type of industry.

The popularity of the course with the thirty thousand employees enrolled is due to the clear, simple, and eye opening nature of the study methods. The foremen like it because it holds their interest throughout and leaves them with a new insight into their jobs. It has made good with the management because it develops a greater spirit of team work in the plant, energizes the men to more productive effort, and has an appreciable effect in reducing labor turnover and costs.

Your big problem today is economical operation. You should therefore read our brief report "Making Better Foremen," which we gladly send to executives without obligation. It gives all details of our unique plan, and the experience of some of the well-known concerns who have used it.

Business Training Corporation

"Greater Team Work Through Group Training."

185 Madison Avenue *New York City*

Business Training Corporation 185 Madison Avenue NEW YORK, N. Y.

Send me without obligation the Special Report, "A Plan for Making Better Foremen."

*Name*_____

*Company*_____

*Address*_____

*Position*_____

*Number of Employees*_____

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(Continued from Page 30)

layman's idea, the colors are not merely various shades of gray. It has been found that the camera renders fine degrees of distinction between colors, and for that reason many gaudy colors are used in reproducing settings, just as they appear in the original scene); a wallpaper department which can supply not only a wide variety of patterns, but a wide range of quality—from the cheap paper to the finer ingrains and embossed effects; and, lastly (though we may have overlooked an item or two) a property department.

The property department either "has it," or "can get it for you." "It" being anything from a baby's rattle to a bird-cage or a kitchen stove. This department is simply the property-room of the theatre, on a much larger scale. Where the props man of the theatre grudgingly supplies a near approach to what is wanted, the property department of the big motion picture studio takes pride in never being "stumped."

As an instance of what this agglomeration of architects, carpenters, painters, and so on can do in the way of reproducing a scene, turn back to page 11, and note the illustration midway down on the right-hand side of that page. Any New Yorker familiar with his city can identify this cross-street section of the Third Avenue "L" without difficulty. Some of them even patronize the dentist, whose sign appears at the right of the illustration; others know the fruit-stand immediately beneath the sign; even the one raised awning at the left is familiar to daily passers-by. Nevertheless, this is not a picture of that familiar street-scene; it is a picture of the setting constructed on the studio lot in California!

All the work of planning and reproducing a given setting, however, would be wasted effort if the director had to depend upon sunlight alone in "shooting" the action. The variable quality of daylight, and the need for special lighting effects has produced a new technical branch of this ever-growing industry. The lighting expert, who works in co-operation with both Screen Director and Art Director, has had to develop his knowledge and his craft to keep pace with the forward march. Ordinary arcs and Cooper Hewitt mercury vapor lamps are still used, just as they were in the early days of the industry, but they have been relegated to a place of minor importance. "Klieglights," big lights with double carbon arcs, are used for general illumination of the entire setting. "Sun Arcs," more powerful than any other artificial lights, are used for illuminating large settings, and for producing moonlight or sunlight effects through windows or doorways. "Spots" and "Baby Spots," which are small single carbon arcs with condensing lenses to produce a narrow beam of light, are used in a variety of ways: for example, by throwing the beam of a spotlight on the back of an actor's head, the image is made to stand out from the background with a distinctness that gives perspective and depth.

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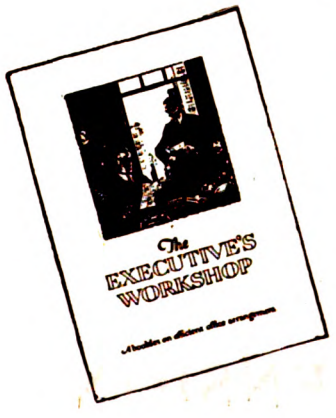
Is Your Desk a Help— or a Hindrance?

ALL of us can do better work when we concentrate on the thing at hand. Orderliness isn't merely a matter of appearance; having "a place for everything, and everything in its place" means that your mind is free from interruptions due to searching for mislaid documents and data.

Under present-day demands for rigid economy, many executives are compelled to get along with curtailed clerical staffs. They find it necessary to do for themselves many of the things that a secretary or file clerk used to do for them.

The "Y and E" Efficiency Desk

REG. U.S. PAT. OFF.



is performing the functions of an additional secretary for thousands of executives—saving time and enabling them to work at higher speed with less strain.

Built in six distinct models, each with a variety of possible combinations in the way of drawer equipment, among them is exactly the right desk for YOU. An individual desk, designed and equipped so that every record, every document—and, of course, pencils, paper, and so on—is right where you can lay your hands on it instantly, without interrupting your train of thought.

Irrespective of whether or not you need a desk, you will find the booklet "The Executive's Workshop" a veritable mine of information on planning the day's work, arranging the office equipment, and so on. Your copy will be sent on request, without cost or obligation.

YAWMAN AND ERBE MFG. CO.

343 St. Paul Street, ROCHESTER, N. Y.

Branches and Agents in all principal cities

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Are You Thinking Beyond Your Job?

You can't stand still----if you are not going ahead, you are falling behind.
Do you want to know the secret of success?

INDUSTRIAL EXTENSION INSTITUTE,

9 East 45th Street, New York City

The Only Complete Course in Industrial Management

Copyright 1922, Industrial Extension Institute.

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Can You Fill This Job?

There are more than fifty billion dollars invested in industrial enterprises in the United States.

The men who are entrusted with the management of these industries are trained men. They are men who have the management viewpoint.

They constantly visualize the operations of every department and intelligently guide the whole organization toward more efficient production.

This is the keynote of American business today—*More Efficient Production*—and the big reward is going to industrial managers—who understand the control of *men, methods, material* and *equipment.*

The opportunity in this comparatively new profession of Industrial Engineering and Management is attracting the live men—the doers—the men who want to take a red blooded part in American industry.

How about you?

1922 is going to be a big industrial year. Our factories must produce—they are going to produce, but they must meet intense competition. The trained industrial man is going to be "King." The one department man is dead.

The all department man in industry—the man with the Management Viewpoint—will name his own salary.

Will you?

The Industrial Extension Institute offers to you the "Factory Management Course and Service." An *organized* course of reading and study prepared by sixty of America's leading industrial specialists. Men who have met and solved industrial problems of every kind and who have put into the Course their combined brains and experience.

The Course is thoroly practical and covers every phase of Industrial Management.

Thousands of presidents, vice-presidents, general managers, engineers, superintendents, accountants, and other men engaged in industrial work have enrolled for the Course. They are preparing themselves for the big jobs which are ahead.

Hundreds of men have been enrolled in such organizations as the DuPont Co., General Motors Co., New Jersey Zinc Co., Aluminum Co. of America, Robert Gair Co., Bethlehem Steel Co., Worthington Pump and Mach'y Co., General Electric Co., Erie R. R. Co. and so on thru America's most representative industrial plants.

These are definite indications of the value of the Factory Management Course and the Consulting Service which goes with it.

Why don't you investigate it?

We have an interesting booklet, "Thinking Beyond Your Job," that tell you everything you want to know about the "Factory Management Course and Service." It will be sent to you without any obligation on your part, if you will fill out this coupon and mail it to us today.

Industrial Extension Institute
Nine East Forty-fifth St.,
New York City.

Send me "THINKING BEYOND YOUR JOB" *without obligation.*

NAME .....

HOME ADDRESS .....

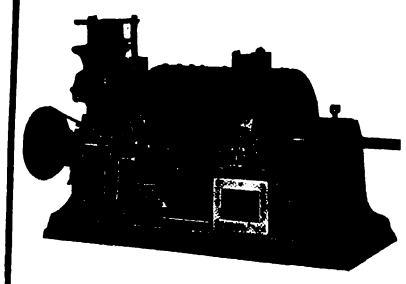
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(Ind. Illus. Mar. 1922.)

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Pulverized Coal



The Aero Unit System

of Pulverized Coal again demonstrates, as in other work of human endeavor, how an original idea at first worked out by complicated and costly methods is finally simplified and perfected until it becomes a part of our every day existence.

The Unit System reduces the equipment and therefore the cost to a minimum by placing the Aero Pulverizer at the furnace where the coal is fed to the machine undried and is exhausted therefrom directly into the furnace. There are no dryers, no storage or long lines of transportation for the powdered coal, thus eliminating the hazard of fire or explosion.

Each Aero Pulverizer is designed as a complete powdered fuel unit for one furnace. They are built in standard sizes ranging from 600 lbs. to 5000 lbs. of coal per hour.

Bulletin Sent on Request

AERO PULVERIZER COMPANY

165 Broadway
New York

(Continued from Page 33)

Different types require different intensities of lighting, a blond requiring a less intense light than a brunette. Certain types of face require careful cross-lighting, to bring out the features without unduly magnifying slight imperfections or facial lines. Sometimes, where the actor's head is bent forward, shadows would be cast in grotesque fashion on the eyes, mouth and chin; in such cases a "baby spot" on the floor in front of him throws a beam of light upward to counteract these shadows. The actor's make-up has a great deal to do with the amount of lighting necessary for best results, and both cameraman and lighting expert have to take this into consideration when planning the lighting effects; often, where there are several characters in a scene, some extremely light-complexioned and some very dark, it is necessary to compromise between the respective lighting requirements in order to get the best results.

Just as the Art Director must study the scenario thoroughly in order to plan the settings, so the lighting experts must study the settings and the actors of each scene and plan the lighting effects with both these factors in mind. Where the walls and hangings are dark, a great deal more illumination is necessary than where they are light in tone; and guesswork in this matter of general illumination is too costly in film and time wasted. In one of the illustrations accompanying this article, Mr. Mills, the Lasky Studio Illuminating Engineer, is shown testing the reflecting power of a setting, to determine how much general illumination will be needed—"general illumination" being the lighting of the entire scene, aside from the various spotlights and Klieglights to be used on the actors and for special effects.

In addition to the two kinds of lighting—for the actors and for general illumination—many scenes call for a third special sort of light. For example, when you see an actor on the screen light a match to light the gas, the moment he touches the flame to the gas-jet there is bright light flooding the entire scene. A moment's thought will serve to show that the gaslight itself could not have produced this intense illumination. What actually happens is that at the moment when the actor applies the flame to the gas-jet the cameraman presses a switch which controls floodlights focussed on the setting. In cases where an electric table lamp with, say, three chain-socket bulbs, is lighted by an actor pulling first one chain and then another, it looks (on the screen) exactly as though at each pull an added bulb were turned on under the shade. Instead, a baby arc, with three steps of resistance, produces the successive degrees of brilliancy. Similarly, neither an open fire nor a coal-oil lamp will register a sufficiently intense light to give the proper effect on the screen. In the former case, a carbon arc, concealed at the back of the hearth, throws its beam through the gas-flames (or, sometimes, through the flames of an actual wood-fire); in the latter, instead of a kerosene lamp-burner, a baby arc is situated inside the globe.

One of the most ingenious mechanical devices in connection with lighting effects—and one, incidentally, which illustrates how painstaking is the striving for realism in even the minor details—is shown in the illustration on page twelve. Many of us supposed that when we saw a man on the screen light a cigarette, his face illuminated by the glow of the match, that was all there was to it. To convince yourself that the glow of a match would do mighty little illuminating, notice the illustration at the top of that same page, where a lighted match is being applied to the gas-jet. Lighting experts worked over this little problem for some time, because the weird effect was worth getting if it could be obtained. And the miniature arc, which fits into a man's cupped hands, was the result. Wires pass up his sleeve and down under his coat, to a plug connecting with the source of current. As he goes through the motion of striking a match, the actor brings his cupped hands up and presses the plunger which lights the miniature arc; releasing the plunger again as he pretends to throw the match away.

(Continued on Page 38)

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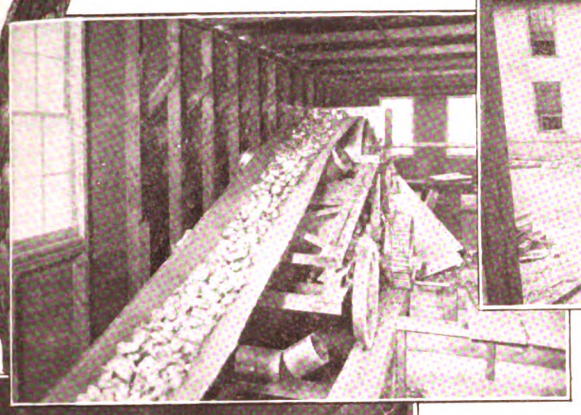
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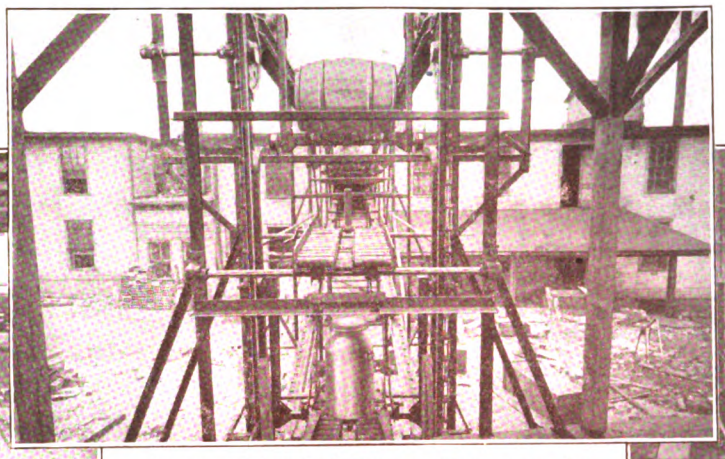
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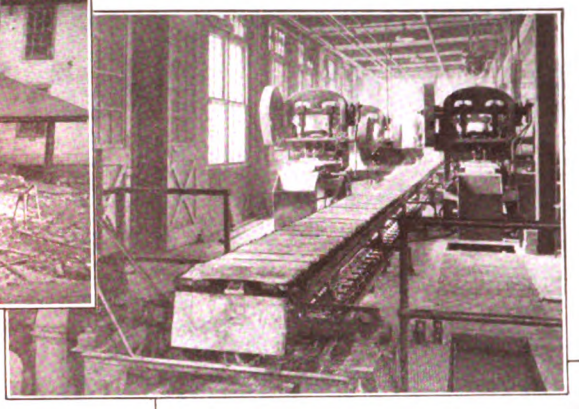
Coal company belt conveyor with hand propelled tripper.

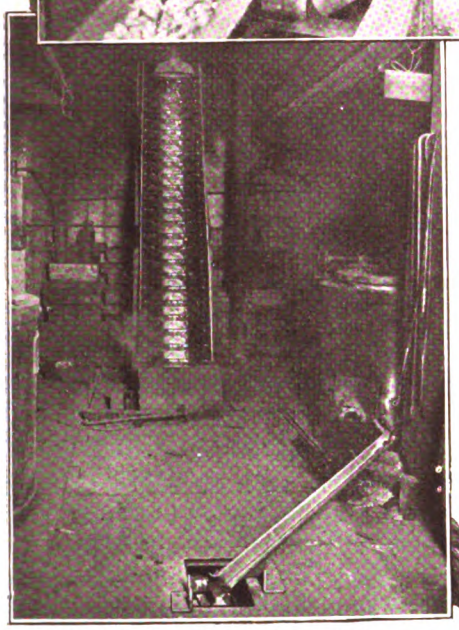




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Grid conveyors for special inspection work —total length of installation is 240 feet.



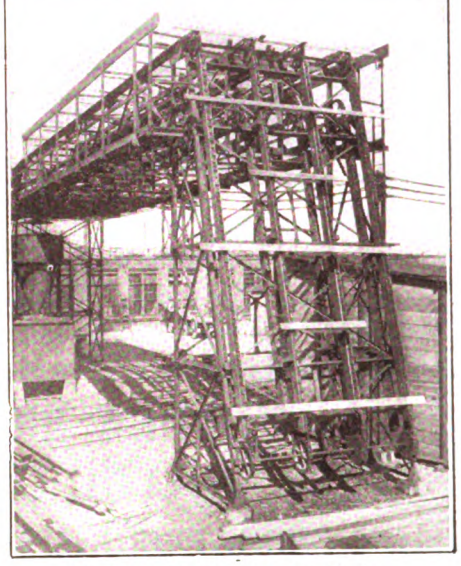


Continuous conveyer receiving molten lead, moulding it to pigs and delivering it frozen solid.

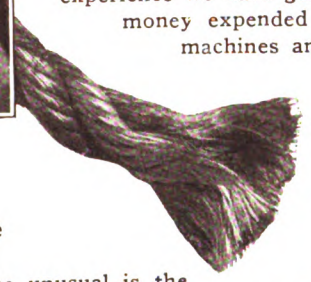
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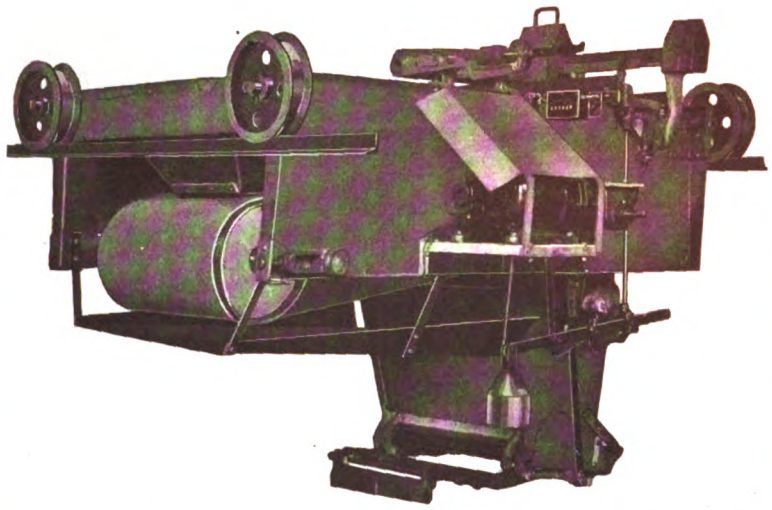
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(Continued from Page 36)

In addition to the various primary light sources, the illuminating engineer encounters in the motion picture industry the subject of reflected light. For example, where a setting is so large that numerous spotlights would be impractical to secure backlighting (light thrown from in back of the actors to throw them into relief), sometimes an immense reflector is hung in back, high enough to be out of range of the camera, and a powerful searchlight is reflected from this surface to accomplish the desired result. From ordinary mirrors, the reflecting surfaces used for special effects range all the way to cream-tinted mat surfaces for very soft diffusion, rippled-surfaces of tinfoil, for example, being especially useful for reflecting sunlight without giving a pronounced glare.

There is, of course, a fundamental difference between the problems of the ordinary illuminating engineer and those of the motion picture illuminating expert. Photographic film is sensitive only to the actinic rays of light, and is especially sensitive to the ultra-violet rays—while the human eye cannot perceive the latter at all. At the other end of the spectrum, the red light rays, while impressing themselves brilliantly on the eye, fail to register any appreciable effect upon the photographic film. Thus, while the light-value of various colors and shades had been previously brought down to a science, the *photographic* light-value was something quite different, and Mr. Mills (who ranks among the highest in motion picture lighting science) had to do a considerable amount of pioneering.

The generally accepted belief is that there is no whiter light than pure white; that a newly laundered white handkerchief, for example, is about as white a piece of linen as can be imagined. The camera, however, scorns such simplicity; on the film, this white handkerchief shows a rather dirty grey, whereas a certain shade of bright yellow photographs pure white. Again, we speak of a "bright, vivid red"; but the camera sees nothing bright or vivid about it, and registers it as black.

Some of these seeming eccentricities of the film can be cured by the interposition of ray-filters, plates of colored glass before the lens, but ray-filters lessen the light passing through, and thus slow up the speed of the camera lens too much. For that reason, not only must the colors used for the setting be carefully chosen, but the make-up of the actors becomes something weird to behold. Those beautiful, ethereally pale blondes you see on the screen are not just naturally pale—the palest human complexion registers gray—but are made up that way; and not with an excess of white face powder, but with an atrocious shade of bright yellow grease paint.

A great deal has been written about "screen personality." Undoubtedly there is such a thing. Nevertheless, the mechanical and technical side of motion picture production has made such tremendous strides in the last few years that many observers are predicting a new era in the very near future. Inevitably, as scenic and lighting effects reach a higher standard of perfection, mediocre acting is bound to stand out in bolder relief. When stage settings were crude, and lighting effects rudimentary, it took a big name and a well press-agented personality to "put across" a production that would satisfy the public. Latterly, however, several producers have demonstrated that with a really good plot, well staged, well acted and efficiently directed, the discriminating public cares mighty little about the all-star cast; more and more, the tendency is toward better productions, rather than mere exploitation of personality.

The credit for this improvement is due partly to the foresight of some of the bigger minds among film directors, who sensed the need for higher standards. These men, however, could have accomplished nothing had it not been for the work of those others whose names are never featured in any program: the men who developed and adapted and invented the multitude of accessories and devices without which even the most skilled director would be helpless.

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Ventilating the Big Tunnel

(*Continued from Page 9*)

rence. These gases always contained on examination a large proportion of carbon monoxide and many cases of asphixiation of workmen occurred before the danger had been fully realized. My investigations led to the conclusion that *only .25 of one per cent. of CO* was sufficient to cause the death of a person exposed to it for one hour. In the course of my investigations, I was often made sick by inhaling the manhole gases, even for a very short time; so you can readily see how vitally important it is to insure that the tunnel air be made safe beyond question. A standard of purity or rather of vitiation must be maintained always; that will not be injurious to health with any reasonable period of exposure."

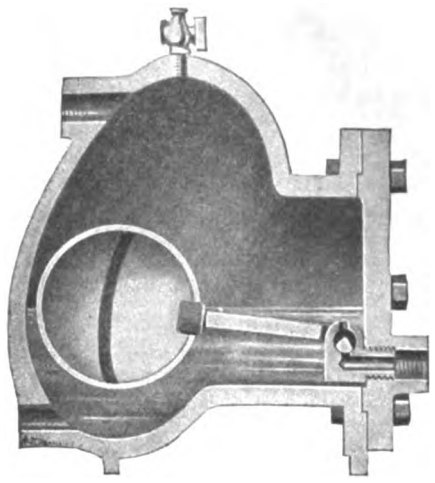
As an indication of the careful experimental investigation that has been undertaken by the engineers responsible for the design and construction of the tunnel, it is interesting to learn that in collaboration with the U. S. Bureau of Mines, a series of tests has been undertaken in a tunnel forming part of a Pennsylvania coal mine. This tunnel is said to be almost one-half mile long, 9 ft. wide and 8 ft. high and is more than 100 ft. below ground level. It is built with an air duct above the ceiling and another beneath the roadway in order to simulate as closely as possible the construction of the proposed New Jersey tube. Through these ducts air is forced by a powerful blower; and a suction fan can be operated to help draw air out of the tunnel. The tests consist in running ten automobiles at a speed of ten miles per hour for a given number of hours; each driver keeping 40 ft. behind the car in front of him. The quantities of air forced in or drawn out were varied and at the conclusion of every test, drivers and mechanicians were examined by physicians as to physical or nervous condition and tests made to determine to what extent the blood of each subject showed the presence of carbon monoxide. At various points, air sampling tubes and other recording instruments for showing temperature, humidity, etc., were installed. Other tests have been made in the laboratories at Yale, demonstrating conclusively that CO in air in the proportion of .0004 or .04 of one per cent, is not injurious to human beings, unless they are exposed for a long period.

"Bids for constructing the tunnel were received a short time ago and the lowest was $19,331,723. Considering the importance of this vehicle tube and its great value as a connecting link between the two communities," said Mr. Baldwin, "it would seem the better judgment to make it larger, at least under the river; even to spend $20,000,000 more, if necessary. Make the air ducts, above and below the roadway much larger, so as to offer the minimum of resistance and obstruction to the flow of the vast quantity of air that must be forced through to provide adequate ventilation. I would suggest that a 10,000-horse power plant be installed, instead of the 8,000-horse power unit proposed. Remember, that should experience with the completed tunnel demonstrate that more air must be supplied, the only way to do it will be to increase the pressure; and when we do this, the heat developed by compression is an important factor and frictional resistance must be reckoned with, particularly in the ducts under the roadway, which will be obstructed with posts and drainage pipes, etc."

To further emphasize the force of his remarks, Mr. Baldwin said: "The power necessary to force air through a tube or duct increases in a much more rapid ratio, than the increase of quantity. For instance, if it were desired to double the quantity of the air in order to insure better ventilation, the power required to do so, would be very much more than four times what it was before."

Coming from an engineer of Mr. Baldwin's experience, these comments on tunnel ventilation are highly significant. In view of the time that will be required to construct the New Jersey tunnel, it is not too much to expect that improvement in motors and carburetors will have been made that will largely diminish the quantity of the deadly CO given off, or prevent its information.

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Forging Crankshafts with the Aid of the Acetylene Torch

(Continued from Page 15)

to the required angles. The Radiagraph, a portable, self-propelled machine weighing about 50 pounds, can be readily picked up, carried to the work and adjusted to whatever position required for cutting. The torch may be adjusted to any angle and cutting will proceed at the angle set, through steel of any thickness up to 15 inches, or more. Feed motion is derived from a small electric motor driving through a gearbox that provides for twenty speeds, thus taking care of the range from 1/2 inch to the limit of capacity.

A fine example of the use of the Radiagraph is illustrated in the accompanying views taken during the progress of working out three-throw shafts in the forge shop of the Atlantic Basin Iron Works, Brooklyn, N. Y. Fig. 1 shows two forged blooms about 8 feet long, 18 inches wide and 8 inches thick which were to be converted into three-throw shafts with cranks standing 120 degrees apart, as shown in Fig. 2.

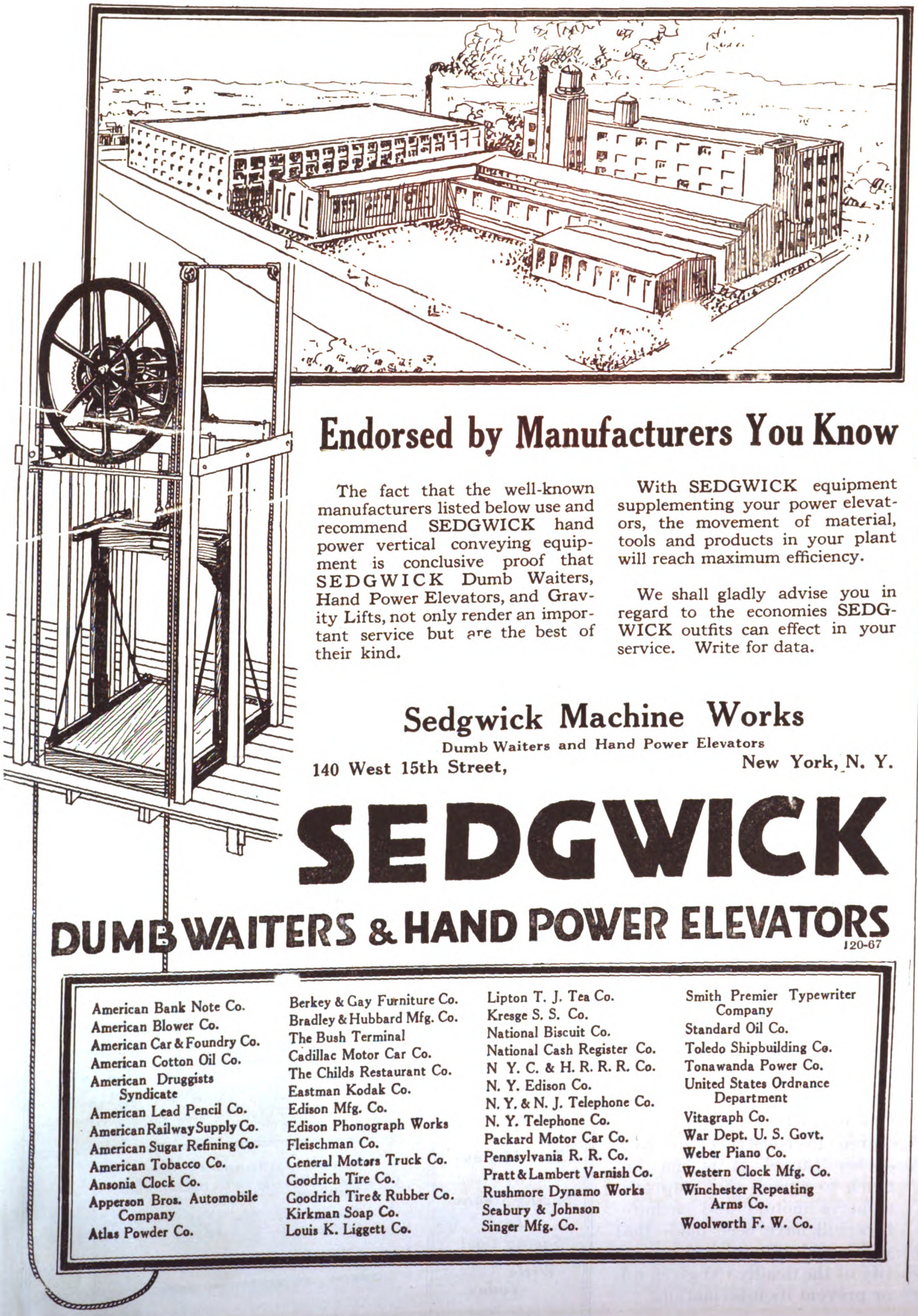
The preliminary operation on the forged bloom was laying out the cuts (see first illustration) and drilling through six holes 1¼ inches diameter into which the cuts were carried and which formed the starting points for the second cuts to remove the blocks A-B-C and D. The chalked lines are plainly visible. Opposite B and C two cut-outs are indicated for which no holes were drilled. At the right and left two vee cuts are laid out for cutting to facilitate breaking down the ends which are to be forged into the end bearing sections. These cuts are considered unnecessary and were not made.

Cutting along the other lines laid out was accomplished through 8-inch steel of about 0 22 carbon content at the rate of 3 to 3½ inches per minute The total of cutting measured 113 lineal inches, and the combined areas of one face of each cut totaled 904 square inches. The consumption of oxygen was 350 cubic feet and of acetylene, about 18 cubic feet. The actual cutting time was about 35 minutes.

The next operation is beveling the corners of the bearing sections E and F with a hand torch to facilitate twisting the crank sections G and H, each 120 degrees away from section I, in opposite directions. This was accomplished by heating the forging at section F to forging temperature, and then placing it under the steam hammer, resting on one corner and striking the section H. The inertia of the forging opposite the heated section F offered sufficient resistance to effect the desired twist.

The shaft was reheated at E, and the operation of twisting repeated, striking the portion G with the hammer and throw-

(Continued on Page 42)



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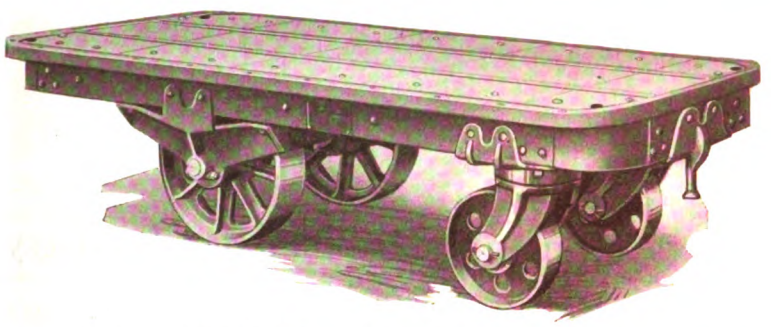
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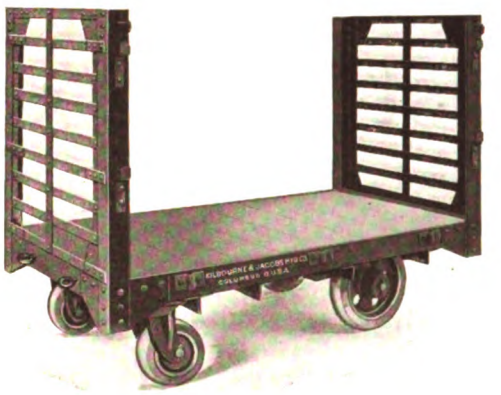


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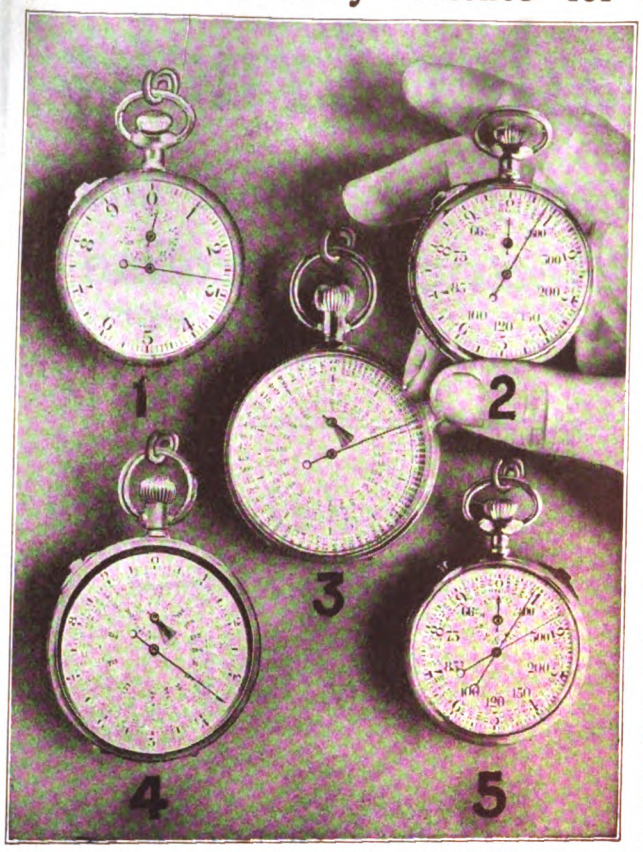
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(AD-D(

(*Continued from Page 40*)

ing it in the opposite direction 120 degrees.

The crankshaft in this stage appears in the fourth photograph, the ends having been forged down and the bearing sections E and F rounded. The next cutting operation is removing the blocks M, N and O between the crank cheeks, thus exposing the sections forming the crank-pins.

Holes at the corners of the crank cheek cuts were drilled subsequent to the twisting and second forging operations, as will be seen in Fig. 7. Cutting out the cheek blocks required about 65 inches of travel of the torch, the cutting rate of 3½ inches taking about 20 minutes. Much more time was taken in setting up and adjusting the machine and forging than for the actual cutting. It is estimated that six hours elapsed time is ample for the preliminary and finish cutting, including placing and setting for the successive cuts.

A Pioneer in the Cement Industry

(*Continued from Page 18*)

under a specification requiring the "best English or German portland cement." Furthermore, after the American product had been used on such great work as the Eads Jetties, the Croton Aqueduct, the great cable roads in New York and Pittsburgh, the first Niagara power development and the early skyscrapers in New York and Philadelphia, journalistic energy was required to make the facts known. In endless battle in engineering society meetings and in public assemblages the fight was made. It is to the credit of those early pioneers, Saylor, Navarro, Millen and others of that group of enthusiasts who gave their best in time and ability to establish the American Portland cement industry, that not a single one of them put the money element above the thing itself and that all worked for the pleasure of the game itself and not for the chips alone. With the establishment of American Portland cement as a reliable product, not only equal to but better than the foreign, came the wonderful mechanical improvements in grinding machinery and rotary kilns, which have marked the progress of the American manufacturer. Out of it all grew the American Portland Cement Association, of which Mr. Lesley was the first president, and which, as a purely scientific and technical body, has kept and improved standards of quality, and developed many new uses for concrete, among them the concrete road. This Association today is recognized as a co-equal of the great engineering societies of our county, as is shown by its association with their committees on all joint committees having to do with concrete and its various elements.

"In seeking to hasten the development of the Portland cement industry in the United States, I found that there was a tremendous field to cover other than that which lay at the factory door or on the selling side of the industry," said Mr. Lesley. "To illustrate, it has been my pleasure to have travelled thousands of miles and to have spent thousands of dollars in the acquisition of knowledge having to do with the manufacture and uses of cement in this country and abroad. It has brought me in contact with and has led to intimate friendships among a class of men than whom there is none finer in the world—our great chemists and engineers—and I have always profited by it in every way, perhaps least of all financially, but deriving great satisfaction from association with constructive minds and the knowledge that I had a comprehensive grasp of the industry. For the same reason I subscribed to all the important foreign and home publications dealing with cement and its uses. In this way we multiply our knowledge or experience through systematic study

(*Continued on Page 45*)

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"PREDETERMINED COSTS"

INDUSTRIAL Executives who are striving to establish a safe and firm basis upon which to build up future business, must recognize the value and importance of the function of Cost Accounting.

Inasmuch as the cost of the product usually constitutes the basis upon which sales prices are established, one can readily appreciate that such cost must be absolutely accurate and reliable. Under the accounting methods generally used, cost fluctuations are incorrectly capitalized, the fact being that these losses or gains should be set forth as inefficiences in productive operations or processes.

For the purpose of segregating such profits and losses from the manufacturing costs, in order that a more stabilized basis may be provided upon which to establish selling prices, the principles of Cost Predetermination are being generally adopted.

We have prepared for distribution to executives a booklet outlining the principles of "PREDETERMINED COSTS," a copy of which will be forwarded upon request.

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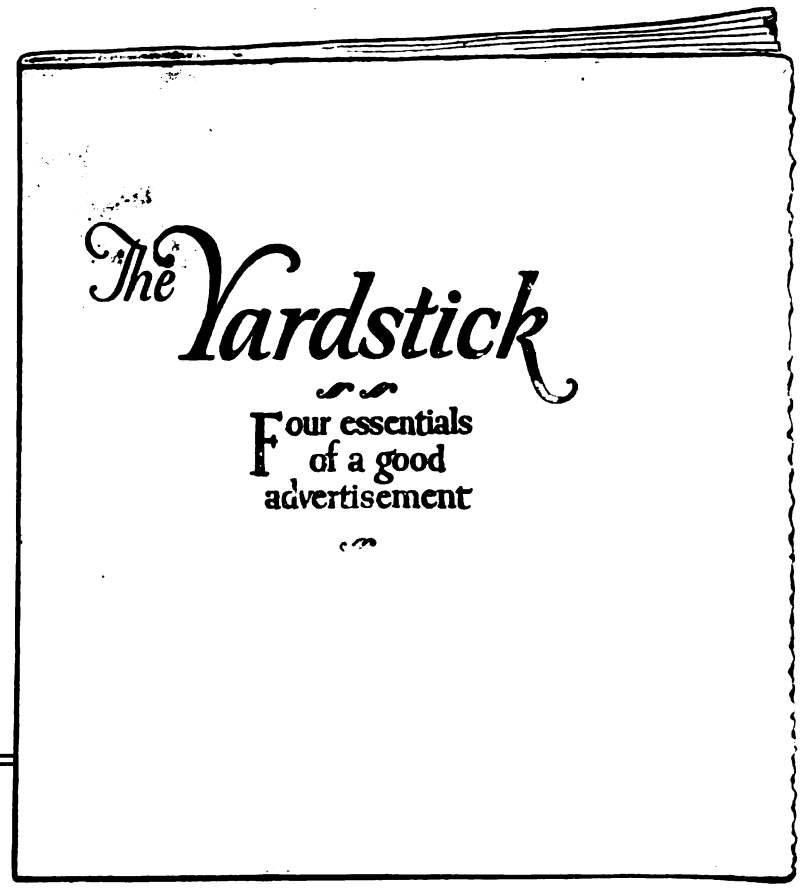
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(Continued from Page 42)

of the experience of others. I am still a subscriber to these and many others of our leading industrial and scientific papers—would feel as though stumbling in the dark without them. Our modern scientific and technical journals offer a wonderful medium for such multiplication of experience, and I have time and time again been saved from mistakes and been pointed toward successful new undertakings because of the habit of glancing over the pages of many such publications in diversified fields of effort. Just at the present moment, for example, some of our big cement plants are making important experiments in the use of a hitherto wasted by-product, a thought that was suggested to me by reading one of these industrial articles. I cannot understand why so many business men overlook this opportunity and allow these publications to accumulate unopened or to remain unread."

Thus prolific reading and the accumulation of ideas that it entails is one of the secrets of Mr. Lesley's successful work. It necessitates, of course, having time to read, and this in turn depends upon the efficiency of one's methods of thinking. Some men think only in details or in absolute values. Others think in terms of principles and proportions. Mr. Lesley has schooled himself along this line. He thinks in ratios or relationships, which is the key not only to accurate thinking but to rapid thinking, and is the solution for the business man who finds he has not time to read all that he should.

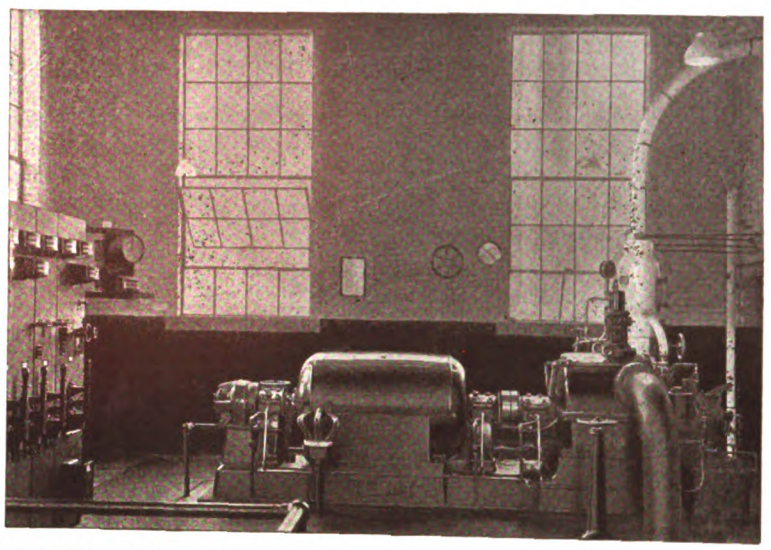
"It is really simple after one accustoms himself to this sort of thinking," said Mr. Lesley. "It is like a child arranging a pattern of blocks on a table. If one of the blocks is out of proportion, let us say rectangular instead of square, he will observe the discrepancy at once while the linear dimensions of these blocks expressed in figures and separately, would mean nothing to him."

Mr. Lesley has original and interesting views regarding a useful education for our future industrial engineers. "They should be trained," said he, "to search for the three great wastes in which lie the possibilities of great sources of wealth. Whenever the young technical graduate sees colored water, or gas or smoke coming from an industrial plant, he should ask 'why is it' and 'what is it'? Whenever he sees earth of a peculiar color or appearance that is not just plain 'dirt,' he should do the same. By thus developing a tendency toward unquenchable curiosity for these why's and what's, we will educate a generation of waste eliminators who will add measurably to America's wealth by reducing America's wastes."

What formula, or rule of living, thinking and working has Mr. Lesley followed—how has he kept young after fifty years of strenuous business activity?

First, for the physical formula that has kept him fit. Every morning for thirty years he has been up and dressed at sunrise at his suburban home, awaiting the coming of his physical trainer from Phila-

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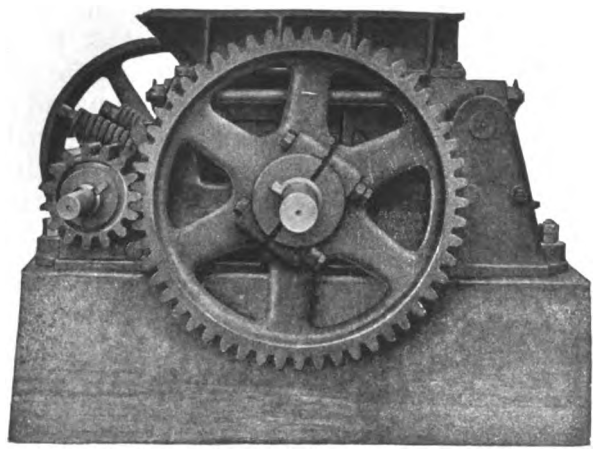


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(*Continued from Page 45*)

delphia. Then has followed and still follows, daily before breakfast, a half hour hike or a short run over country roads, interspersed with settingup exercises. After this a session with a light medicine ball or a few rounds of boxing. Then a moderately cold bath sufficient to bring reaction. This is the formula that puts Mr. Lesley's body and mind into proper mechanical condition for his day's work. It was inaugurated following the approach of a breakdown after months of strenuous activity at Washington as the tariff representative of the Portland cement industry in the days when the business was young and struggling against foreign competition.

Of course, the physical factor, while important, is by no means the only one "As a man thinks, so is he." There must be both a philosophy of life and a definite plan of thinking back of a career of this kind. How Mr. Lesley planned and executed is fully described in the foregoing sketch of his active life.

Better Refrigeration for Perishable Shipments

(*Continued from Page 23*)

the first side close while those on the opposite side open and the brine is forced through the pipes on that side. Thus there is constant circulation of the brine so long as the car is in motion and this circulation absorbs the heat units from both the car and the load. From 3,000 to 4,000 pounds of crushed ice and salt are required to charge an ordinary car, the proportion of the two materials depending upon the temperature desired in the vehicle which, in turn, depends upon the nature of the load being carried and the outside temperature. When the car is not in motion and is held for short periods, the power of the expanding brine is utilized for its circulation. As the heat units are absorbed the temperature of the brine exposed in the pipes is raised and causes expansion. Consequently the circulation is constant whether the car is in motion or not. A car of frozen beef from Chicago to New York, June 25 to 29, stood 53 hours after arrival, with no change in the temperature at the top of the car and a rise of only one degree on the floor.

Repeated shipments of all kinds of produce, meat, fish, fruit, vegetables, etc., from various points on the Pacific coast to the Atlantic and Gulf coasts, and under outside temperatures ranging from 70 to 90 degrees, have demonstrated that this system of refrigeration effects a most substantial saving through the elimination of waste in operation, the ice consumption alone being reduced from 50 to 70 per cent. which, of course, means also the elimination of a certain excess of dead haul. It has the additional advantage of increasing the load space approximately 20 per cent, since it does away with the ice bunkers or brine tanks used in ordinary refrigerator cars.

For example, the Great Northern Railroad reports that one of its cars, loaded with apples and equipped with the automatic brine circulation system, on a trip from Wenatchee, Washington, to Chicago in competition with the bunker type of car saved in refrigerants and the increased earning of a larger load, $130.-73. In actual figures the saving in ice was 11,250 pounds or 62 per cent. in favor of the new system, and the car carried 840 boxes of apples, an excess of 210 boxes over the standard load carried by the end ice bunker type of cars. As a matter of fact, the car could have carried 70 more boxes, making 910 as against 630 boxes for the present standard load in bunker cars. The temperature of the fruit when loaded was 72 degrees and when unloaded in Chicago after twelve days in transit, was 42 degrees. The brine solution was found to be 3 per cent. at the unloading point, and the fruit could easily have been carried to New York without additional ice.

On another occasion the Quartermaster General of the Army sent a car equipped

(*Continued on Page 49*)

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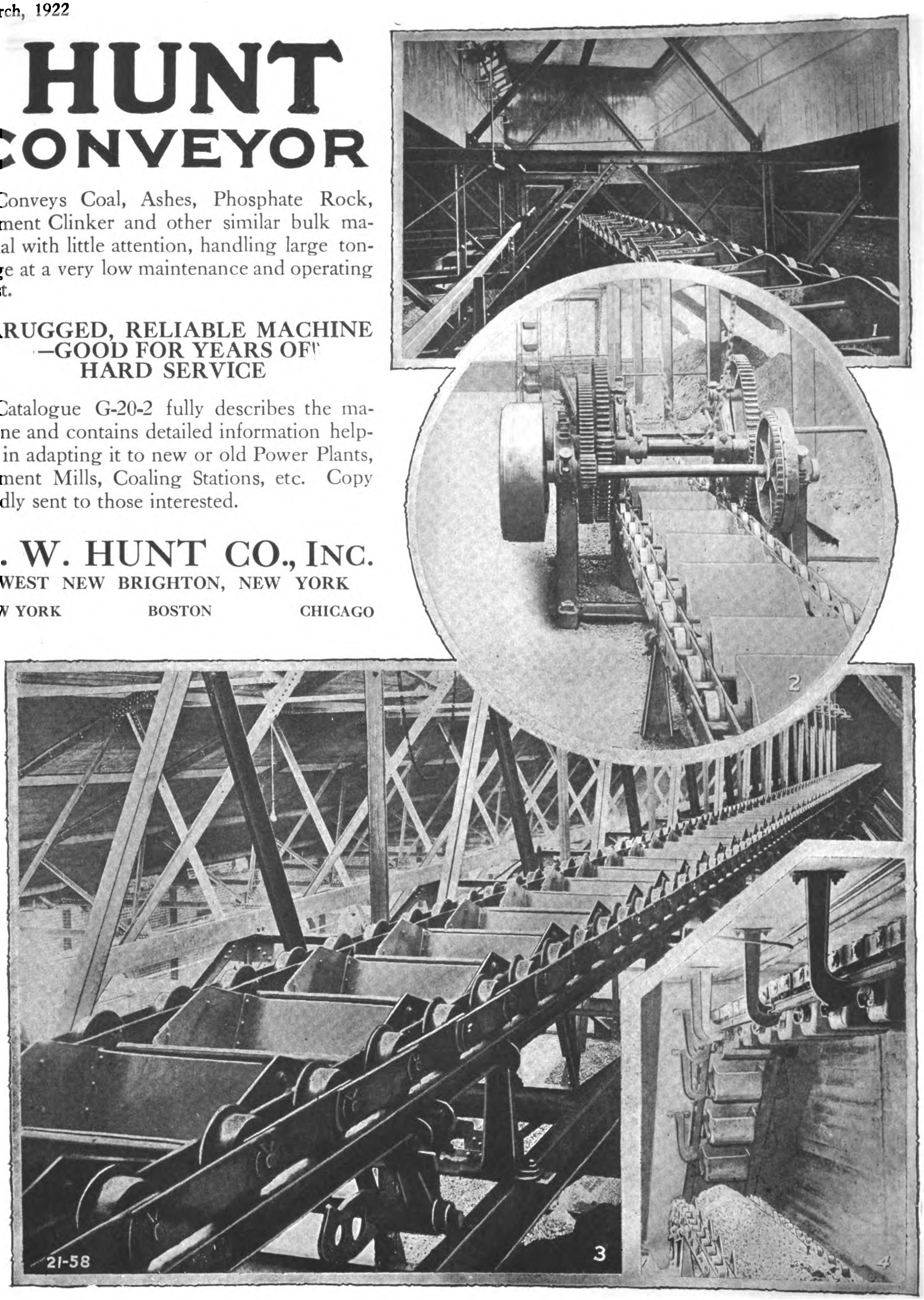
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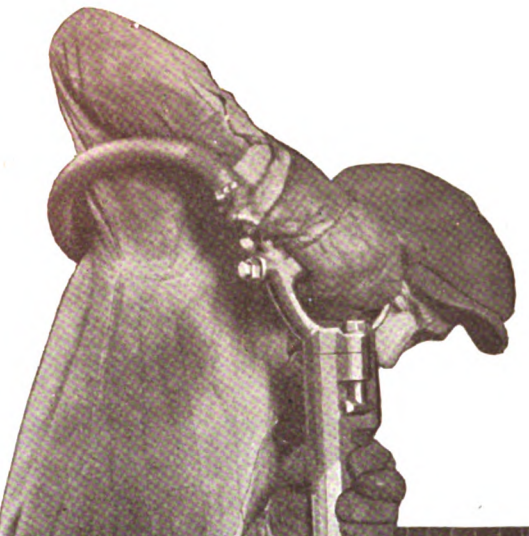
Because of simplicity in design "LITTLE DAVID" Air Tools do more work with less interruptions. They also materially reduce cost of maintenance.

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Catalog 8000; describing these tools, sent on request.

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(Continued from Page 46)

with the new system and a brine tank car from Chicago to New York, in competition. Both cars were loaded with frozen meat. The brine tank car we re-iced four times and used a total of 27,000 pounds of ice, while the automatic brine circulation car was not re-iced at all enroute, stood 53 hours before being unloaded, and used only 7,000 pounds of ice. The temperature of the car at the end of this time, which, added to the time in transit, made a total of 161 hours, was 23 degrees, and the load was in perfect condition.

Still another advantage of the automatic brine circulation system is that under it the atmosphere is much less humid than in the bunker type of cars. The overhead pipes condense, and the drips carry off the surplus moisture. This keeps the car dry and clean throughout and aids in the refrigeration. If desired, ventilation may be installed between the ends of the cars and the tanks. With this arrangement, the outside air comes into and out of the extreme ends of the car, and can be forced down into the body of the car any distance desired. There is, however, nothing in connection with the construction of this system to prevent the installation of any other ventilating system now in general use. While the car is under ventilation, the refrigeration pipes may be shut off entirely, thus preventing the refrigerant until again put into use.

The construction of the automatic brine circulation system is such that it is not limited to refrigerator cars, but may be applied to any moving vehicle such as trucks, boats, etc. Already the system has been installed by a Chicago ice-cream manufacturer in a number of their large electric delivery trucks. In these trucks there is but one tank with pipes, through which the brine circulates and then returns to the tank. The swaying and jolting of the trucks has the same effect of circulating the brine as in the case of railroad cars.

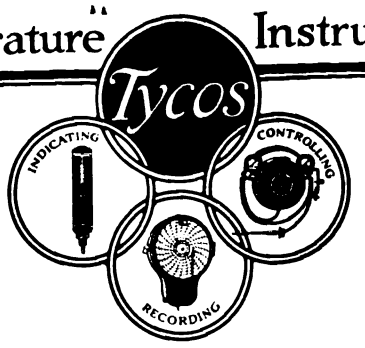
Not the least remarkable features of refrigerator cars equipped with this system is the fact that they may be changed from refrigerator to heater cars, or vice versa, without in any way exposing the lading. The two tanks are connected by pipes running down the end walls and along the floor under the floor racks. When it is desired to heat the car, the over-head pipes are shut off. Water and salt are put into the tanks and the solution heated by steam from a locomotive or any available steam line to such degree as the character of the load and outside temperature conditions may require. The swaying of the moving car then circulates the warm brine through the pipes under the load in the same manner that the cold brine circulates through the upper pipes.

A typical performance of a car equipped with the new system, under heat, was furnished by the passage of a load of apples from Wenatches, Washington, to Calumet, Michigan, in mid-winter last year. The temperature of the fruit when stored was 36 degrees and the outside temperature 34 degrees. Starting January 22, the car reached the end of its journey February 14. A thermograph record made on the car floor between the doorways and about 6 inches from the door, with the thermograph exposed, showed an average temperature in the car of 38 degrees during the entire trip, while the outside temperature ranged below zero from January 28 to February 4, the lowest temperature encountered being 50 degrees below zero for a short period. The apples arrived at their destination without being frosted, and the cost of heating during the entire trip was practically nil. As compared with this, a stove heated car in the same train from the same starting point, with apples, arrived at Milwaukee at the same time with one-third of its entire cargo frozen solid.

Perfect air circulation is of course the great point in refrigeration and well as heating, and the difficulties now confronting all carriers of perishable freight are due to their inability to create such circulation by equipments commonly in use. The reason for this is the placing of the refrigerants or heating medium in the ends, or occasionally, when heating,

(Continued on Page 51)

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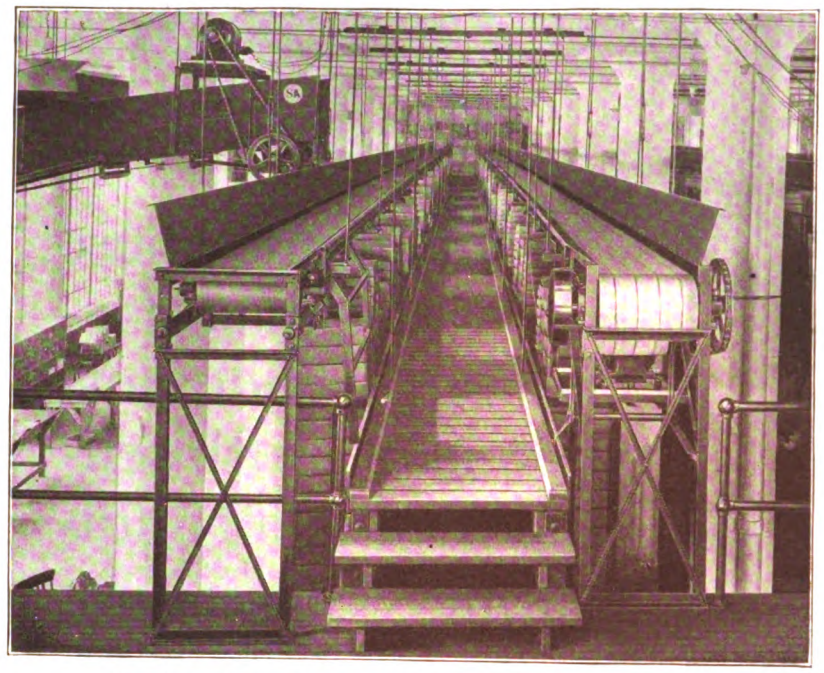


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(Continued from Page 49)

in the center of the car. Under such conditions the temperature in different parts of the load varies greatly, the difference sometimes being as much as 30 degrees, the highest temperature usually occurring in the top tier at the center of the car, and the lowest temperature in the bottom tier at the ends of the car next to the ice bunkers.

In the news system this difficulty is overcome because the refrigeration is applied at the proper point—that is, overhead—thus affording the cooled and dense air opportunity to go from the top down, thereby keeping the temperature at the top and bottom of the car approximately uniform and the temperature at the center of the car as low as at the ends. For heating, the pipes likewise have been placed at the proper point—the bottom of the car—the result being that the warmed air will rise and so create a perfect circulation of air throughout the whole car.

Tests have demonstrated that a car heated by this system will go for three days without attention with an outside temperature as low as 50 degrees below zero. With a higher outside temperature a car will go for a much longer period without attention. The Great Northern took a carload of apples in a car equipped with this system through a temperature of 50 degrees below zero and saved the load.

As in the matter of refrigeration, heating cars by this system means a substantial saving through the elimination of car heaters, their repairs, and the cost of the fuel used. But perhaps the most important point is the fact that all risks of losing the load by freezing or contamination from oil, smoke, or gas, as is frequently the case where ordinary heaters are used, is eliminated.

American Industrial Vitamines

(Continued from Page 8)

words are we encouraging invention and research, or are we discouraging it?''

One might expect that an engineer who had received a quarter of a million dollars in cash for one of his inventions would have no hesitation in saying that American inventors were being properly encouraged. But Dr. Eldred did not take this viewpoint.

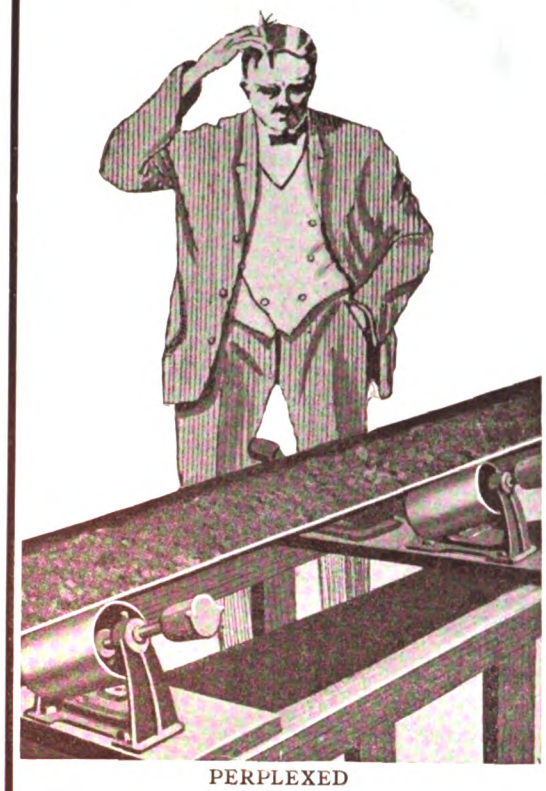
''There are some distinct and rather general tendencies,'' replied Dr. Eldred, ''which, if not corrected, threaten to have serious national consequences. They point to the fact that perhaps we of today do not know as much about *industrial* vitamines as our forefathers did.

''The founders of this nation, most of us will concede, were exceptionally wise and farsighted individuals. The constitution that they framed, and on which our progress materially, politically and even morally has been based, was so wisely constructed—so thoroughly sound in basic principles, so imbued with the necessary vitamines of achievement—that by adhering to it for nearly 150 years we have, as a nation, 'waxed fat and prosperous.'

''In framing this masterpiece, rightly called 'the greatest single work ever struck off by the mind and hand of man,' these builders of a great nation demonstrated their keen recognition of the essential vitamines of accomplishment, both political and industrial. In fact, they laid particular stress and emphasis upon the stimulus to national industrial growth, for in Article One of the Constitution, eighth in order in listing the powers of Congress, immediately following the coining of money and the establishment of the post office, and even preceding the specifications for national defense, the supreme court and the legislative functions, they directed the '*promotion of the arts and sciences by securing for limited times, to scientists and authors, the exclusive rights to their respective writings and discoveries.*'

''If we look back upon the progress that America has made industrially, as well as in the 'arts and sciences,' we are amazed at the extent to which this progress has been due to invention—to individual research and discovery, stimulated by the foresight of the founders of our constitution. Not all inventors have, it is

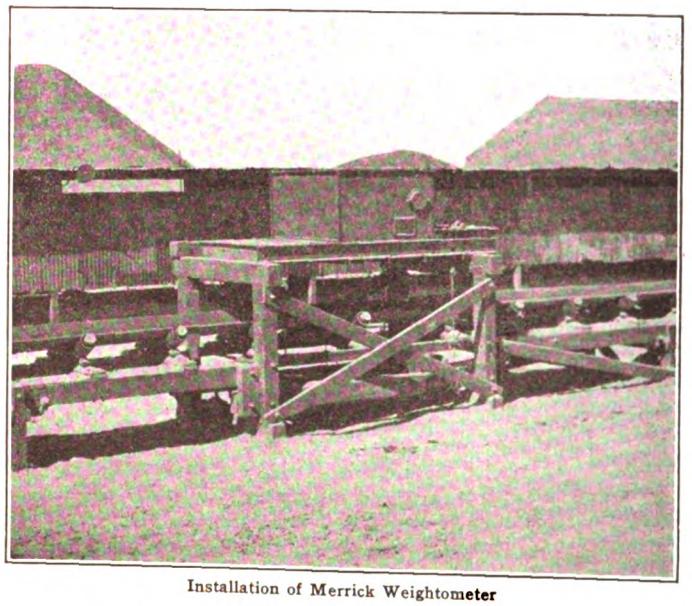
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The Weightometer weighs any material while in transit over a belt, bucket, or pan conveyor, without interrupting the flow and needs no attendant or weighman.



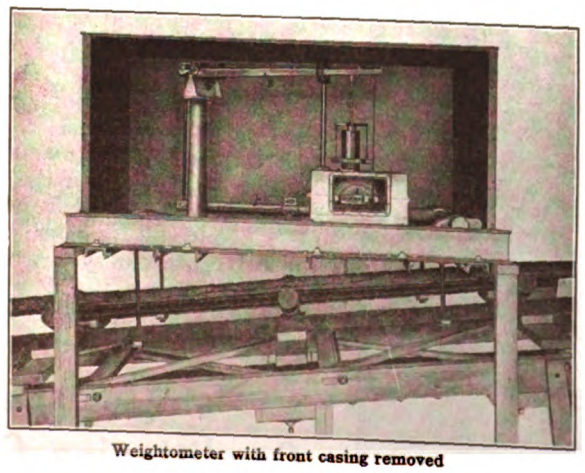
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The Weightometer is guaranteed to weigh within an average accuracy of 99%.

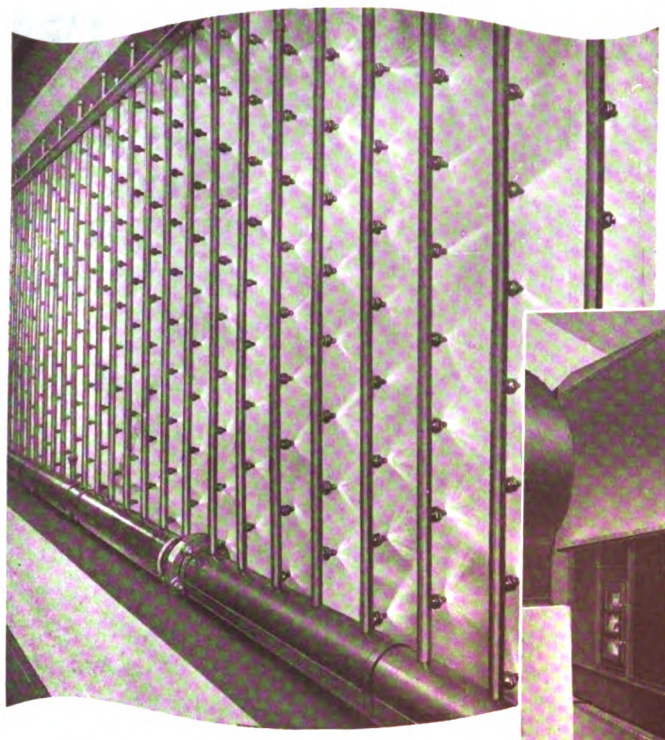


Weightometer with front casing removed

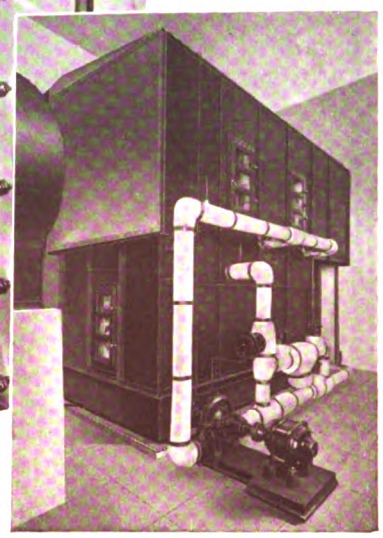
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When an ideal temperature or relative humidity is desired, the modern engineer can produce it within spaces large or small, thus assuring continuous production of the best quality in the maximum quantity.

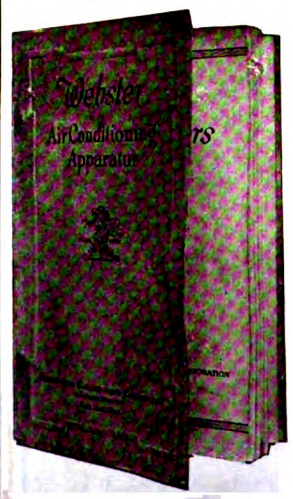
The art has reached a high state of perfection and in various forms can be made to produce just the atmospheric condition to suit any requirement.

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Atmospheric Conditioning Corporation
469 Chestnut Street
PHILADELPHIA

(Continued from Page 51)

true, reaped rewards commensurate with their contribution to progress—in many cases, either through lack of business capacity or faulty patent construction, many have sown what the undeserving have reaped. But, nevertheless, it is a fact that the possibility of securing 'for a limited time,' a government granted monopoly upon new and useful inventions and discoveries has, as our forefathers foresaw it would, so stimulated the individual initiative of our mechanics, manufacturers and artisans, that America today, through the utilization of invented production machinery, maintains a higher average level of living conditions than any other country.

"You may say that the fact that we have been able to do this is sufficient proof that the situation is sound and healthful. This is not quite true, for conditions are gradually changing. Twenty or even ten years ago, for example, no one would have been able to successfully challenge the constitutionally bestowed inventor's monopoly in his creation, to question his right to dispose of it as he saw fit or to sell his patented property at the price that he or his legal assignees deemed most fitting. Today, however, we are confronted with what appears to be an attack upon this constitutionally bestowed inventor's monopoly, in Mr. Untermyer's activities with respect to the prices that the General Electric Company charge for certain patented products. The validity of the patents involved is not questioned. Mr. Untermyer's point of attack is not upon the validity of the patents, which have been substantiated by several court proceedings. His attack is upon the price at which the patented products are sold—he claims that the price, in public interest, is too high, or, in other words that the assignee or patentee are making too great a profit. Regardless of whether this charge is made against a great corporation or an obscure individual inventor, the attack is essentially against the constitutional right of an inventor to the 'exclusive rights' to his invention.

"Naturally, any attack upon a large corporation will receive considerable public support regardless of the principles involved. But let us analyze the functioning of a large corporation from the viewpoint of the general distribution of a patented article—the making available of the invention to the public.

"The primary purpose of our patent system is not to reward inventors. That is secondary. The primary purpose is to put new and useful inventions at the disposal of the public. No one will deny this fact. And being so, it follows that the method which places these new devices most efficiently before the public— i. e., in greatest quantity and at the lowest cost is in greatest public interest.

"Mr. Jones, for example, invents a device of great public value. He obtains a patent for it which creates for him a legal monopoly. No one can or would question his right, if so disposed, to make and sell this device himself, with the labor of his own hands. Making it in this way (we will call the process "A") is expensive, because small scale production is always costly and his product costs $2.00 per unit. He sells it for $3.00 and the investigators and infringers make no complaint, but neither the inventor nor the public have profited much through his creation.

"Jones, on the other hand, may dispose of this same invention to a large corporation which has the necessary capital and facilities to put it into large scale production. Let us call this method "B." The corporation, now possessed of the nationally bestowed monopoly, because of its facilities, makes the article for 30 cents per unit and sells it for 50 cents. The public is thus afforded plentiful opportunity to buy a new and useful product for 50 cents that before could be bought for not less than $3.00. The inventor has received for his rights a sum sufficient to enable him to carry on further research and perhaps bring forth another useful invention. The corporation manufacturing the invention is making a good profit and accumulating from this sufficient funds to buy and put into production another useful invention. The public, in turn, has profited by being able to secure an entirely new and useful device at a price ridiculous-

(Continued on Page 55)

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(Continued from Page 52)

ly low in proportion to the service or convenience it affords.

"Undeniably the public interest is by far best served by the procedure outlined in 'B.' Undoubtedly it most efficiently fosters the progress in accomplishment. But apparently it is regarded in some quarters as immoral because efficient. And in this misconception of the working of accomplishment vitamines lies a grave menace—the danger that we shall lose sight of the public interest in invention; that we will weaken the accomplishment vitamine by attacking these constitutionally conveyed 'exclusive rights.'

"For years our national stimulus to inventors—the 'exclusive right to monopoly for a limited time'—has been becoming less and less effective. Our patent office today is badly undermanned and sadly underpaid. A patent, as issued, is more often than not, merely an excuse for litigation. It offers little protection to the inventor who has no funds. And if Mr. Untermyer's present attack upon the constitutionality of *adjudicated* patents is successful, it would make it unprofitable to invent, discourage research and scientific investigation and make it next to impossible for an inventor to sell a patent.

"While we are going backward in this vital matter other nations are going forward. Germany has thoroughly demonstrated the value of such effort and England proverbially slow to follow new leads, has come to the front, making the issue one of government support.

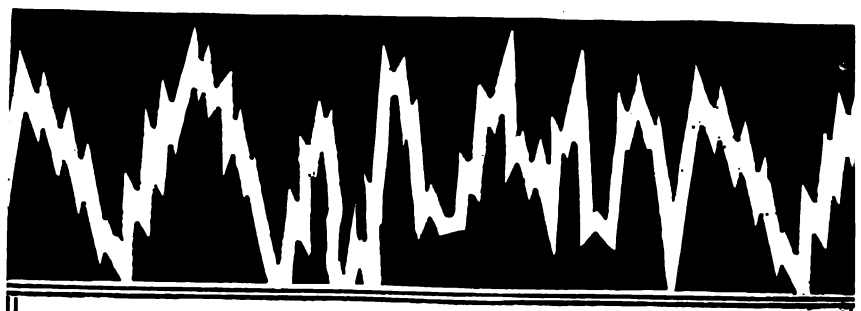
"The Roman civilization, scientists now believe, fell because of malaria carrying mosquitoes. The Aztec civilization fell before a plague of yellow fever. Today through the agency of splendid medical research we have our nation well fortified against physical decadence. If American civilization falls it will not be because of physical retrogression. The danger lies rather in the loss of the accomplishment incentive, the suppression of individual initiative. And nothing will *bring* this retrogression about more surely or effectively than the further weakening of the national protection given to inventors and inventions."

Even More Than Common Sense

(Continued from Page 17)

far as he was himself concerned, and with others that he knew, conditions were not so bad as painted in view of the country-wide depression. Of course, the men were influenced to a great extent by the oratory of the evening, or for that matter, any argument presented with a noisy embellishment, but still their minds were more or less receptive, or else why their applause and strict attention to the speakers?

He waved aside a proffered blank and rising to his feet left the hall. As he walked slowly toward home his mind was on the evening's occurrences. The organizer had put up an able argument. There was no disputing this. His finishing rally, was, of course, merely an appeal to emotions, similar to that of a revival meeting. But his previous talk had been earnest and direct. There was no question but that he had the attention of his listeners, and their accord in their statements. But why? The men were working under as good conditions as were possible in view of the after-effects of the war. Of course there had been wage reductions, but any intelligent man knew that wages must be in proportion to the buying power of the public, or more exact, the competition of world markets. Cheaper production in foreign countries meant shut down factories in this country. The markets were open to all. The high, unwarranted cost of products would never sell them in a low priced market. The thing was plain, either adjusted wages, with goods produced at a cost where people could buy, or fixed war-time pay, with shut down factories and people unable to buy in order that they might perhaps run. That was the cycle. Artificial wages, no work. No work, no buying. Reasonable production costs, a buying market, demand for products of all kinds. Still, in face of the facts, the men were talking strike when the only thing that could keep them at



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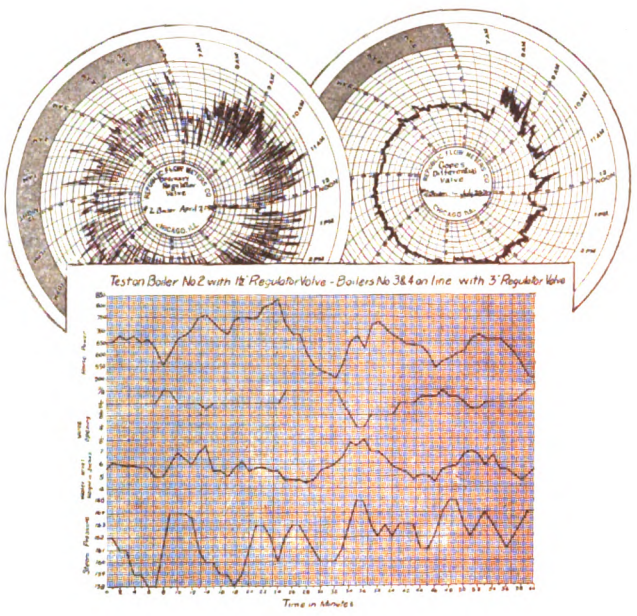


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Every Copes is designed for the specific conditions under which the boiler is to operate. Large factors of safety ensure satisfactory operation on abnormal as well as normal fluctuations in load conditions.

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Note the improvement.

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will save from 2 to 8% of your fuel bill.

In addition they ensure safety and reliability to a degree not obtainable with hand feed.

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work was the very thing that they were protesting over.

The thinker reached his home with the question still unanswered. Why? "It's funny," he thought, "you can get all the dope you care to listen to from an organizer, but I'm blamed if I ever hear the bosses explain their side of the argument. I suppose they argue that out among themselves."

James Currey, owner of the American Novelty Company, sat in a deep study. His desk was littered with documents, and a confusing array of figures bore witness to deep problems. The problem was deep, and large, but so simple! Simply orders on hands; deliveries in small lots as wanted; lack of ready money at hand; high interest rates at the bank, and money scarce at almost any rate; and a close market to fight for. In other words, enough of business on credits, but little cash for current needs. To this was added the imminent strike. This, he felt, was unwarranted and unfair. So far as he was aware, his help had no reason to strike, nor to complain of their working conditions. Of course, wages had been reduced, and working conditions changed since the slump and from those prevailing during the intense drive of the war; but that was to be expected by sensible men; and he had always posted a notice of any contemplated changes. Of course he did not go into any details in the notice, simply told them, but they should realize conditions without being informed. He determined to have the skilled men before him the next day for a heart to heart talk. It would be an innovation, but it would be better than to let things drift without making any direct effort to avert the trouble. With this determination in mind, he threw himself into the task before him.

The next day he faced a curious audience composed of his skilled mechanics. They listened quietly as he talked in a general manner about prevailing conditions; and gave polite attention as he summed up the advantages enjoyed by those working in the plant. With a last statement that any changes from the present would be ruinous and out of the question he dismissed them. They departed talking and snickering among themselves.

After their departure, worn with his worries, he bowed his head on the desk and sought for some way out. He knew that he had lost his men. He could tell by the indifferent expressions on their faces that they would strike when the call came.

He heard a slight rustle at his side and looked up to see a tall, rangy man peering owlishly through a huge pair of tortoise shell glasses.

"Who are you?" he asked the dismal caller.

The visitor made three measured steps to a chair; pulled it into position with one movement; sat down with a certain, clock-like precision; crossed his legs with a brief movement; drew a pocket handkerchief from a hip pocket with one hand, wiped his face with a sweeping motion of the cloth, and catching it with the other hand deposited it in the other hip pocket; the complete action occurring in one, sweeping movement. "I'm an efficiency expert," he said shortly.

The factory owner made him welcome.

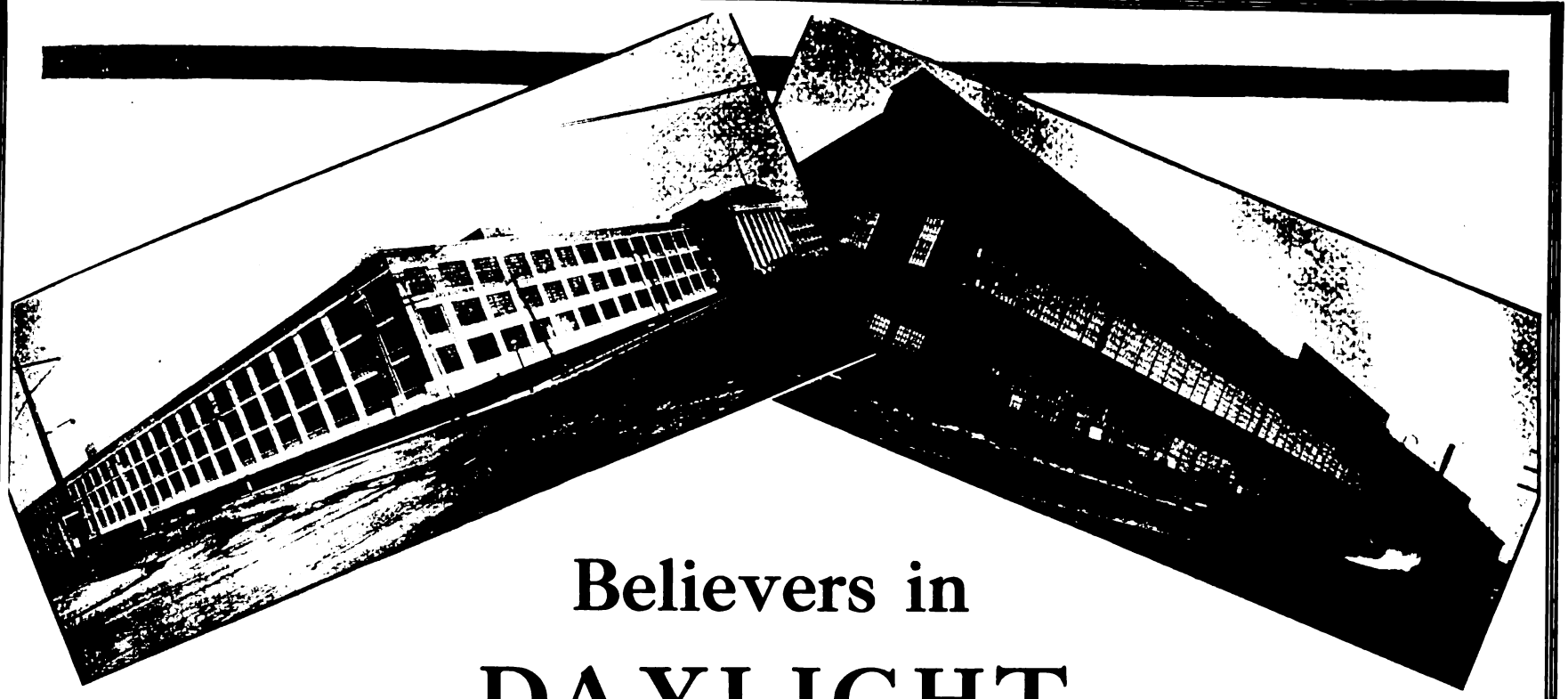
"I have come," said the visitor, "to show you a way out of your troubles. I am an expert efficiency expert, which I can prove by several hundred charts that I have in my possession to record my movements. I am the man you need; and the man you must have if you are to remain in business!"

"But," protested the other, "I have been in business for years, and while I haven't made so much money, still I feel satisfied in the manner in which this business has been built up from a small beginning, until today five hundred men find an opportunity to produce the things necessary for a livelihood, and recreation. In other words, a creation has been established wherein men can produce abundance by their united efforts."

"Very true," said the other, consulting a note book, "but have you a record that you can refer to and tell me what day and date, John Jones in the year five of your creation took twenty-seven steps to reach the tool crib, when the distance can be covered in nineteen? No? Then your creation is not a success!"

(Continued on Page 58)

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(Continued from Page 56)

"But," said the dumbfounded owner, "John Jones was a good man. He's dead now, but he worked here for years and died a Christian."

"Admitted," said the expert. "He died owning three houses and a snug bank account. His success was due to his industry and thrift. By the fact that he became a settled, respected member of the community and avoided changing his job for every whim that cropped up. This I know, and so far as he was concerned it was efficient, profitable use of his labor power; but do you know how many germs it took to kill him? No? By expert efficiency you could have kept a record of the germs he acquired day by day, and when they rose to a dangerous number the man could have been released from production until the germs had been reduced to a condition permitting control. Lacking these vital statistics, the man died and you lost a valuable man!"

"But," said the hazy shop owner, "old John was round seventy-two years old when he died, the last years of which were spent on a pension, puttering around the shop. Why he worked with my father when he first started the concern, and I can tell you that old John deserved a pension and it was with a free heart and will that it was given, even his puttering around the shop was simply because it gave him an interest in life, and by his own request."

"Very well," said the other, "we'll let him die, especially of old age, but how about Brown, the trucker that died and left several children? You lost a man there that efficiency would have saved!"

"Yes," sighed the other, "Brown was more weak than blameworthy. He drank for years, and it seemed a hopeless task to try and break him of the habit. Still, he did not make the rum, nor sell it. It was made for the use of such as him; licensed by the city—which exists by reason of those who produce, of which Brown was one of many; and the traffic was fostered by a government that raised its money for law and order by taxing the stuff that killed Brown. Thank God that the stuff is no longer made as a lawful product! It is wiped out now, but it was too late to save Brown from getting drunk one night and falling into the river. I don't think efficiency would have helped much in that case. His wife is now matron, here in the shop, and his eldest boy is learning a trade. Of course, it is necessary to assist them a bit, but as the house they live in belongs to me, I can allow them their rent free until such time as they become self-supporting, then again, I want to see the second boy through high school, a bright, alert boy, too."

"Very well," sighed the other, "now how about the strike?"

"That has me worried," confessed the shop-owner.

"That is why you need my services," said the expert solemnly.

"What would you do?" asked the harassed owner, curiously.

"First," said the expert, wetting his lips and drawing a long breath, "I'd buy a carload of blank paper, in pads, forms, and so on. Then I would engage a force of men to draw up the hundreds of charts and forms we will need. Then we would turn the works upside down and start all over again. After that, that is, after we had things running again, we'd estimate our success by that of others, and then, of course, adapt our arrangements to suit conditions. Then we would—" But the expert faded away in a mad rush of disordered air which emerged from the exploding shop owner.

The stricken man had hardly recovered from the effects of the expert when the office shook from the impact of a forcible object. He turned in amazement to see a bull-necked man standing with both feet on the floor and as the astonished shop-owner sought to recover his wind the stranger aimed a blow with a heavy ball-bat at a costly chandelier.

"Who in God's name are you?" gasped the shop-owner.

"I'm force," said the other, with a roar: "and I guess that you need my services at once!"

"What?"

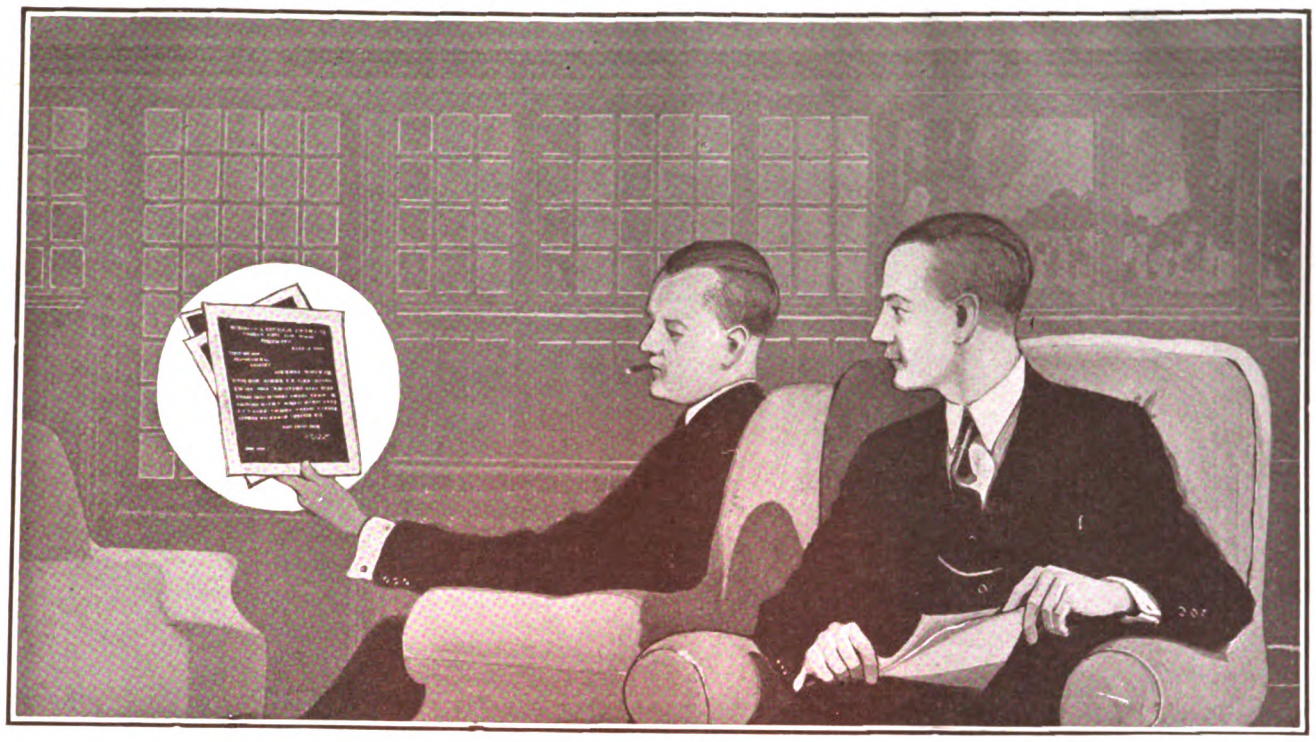
"Yep. To break the strike."

"And what would you do?" asked the other.

"Well," said Force, merrily, "we'd beat 'em up. Cause trouble among them. Arrest a few; get them in a mood

(Continued on Page 60)

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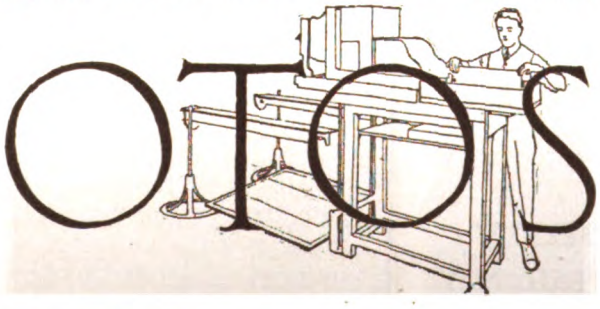
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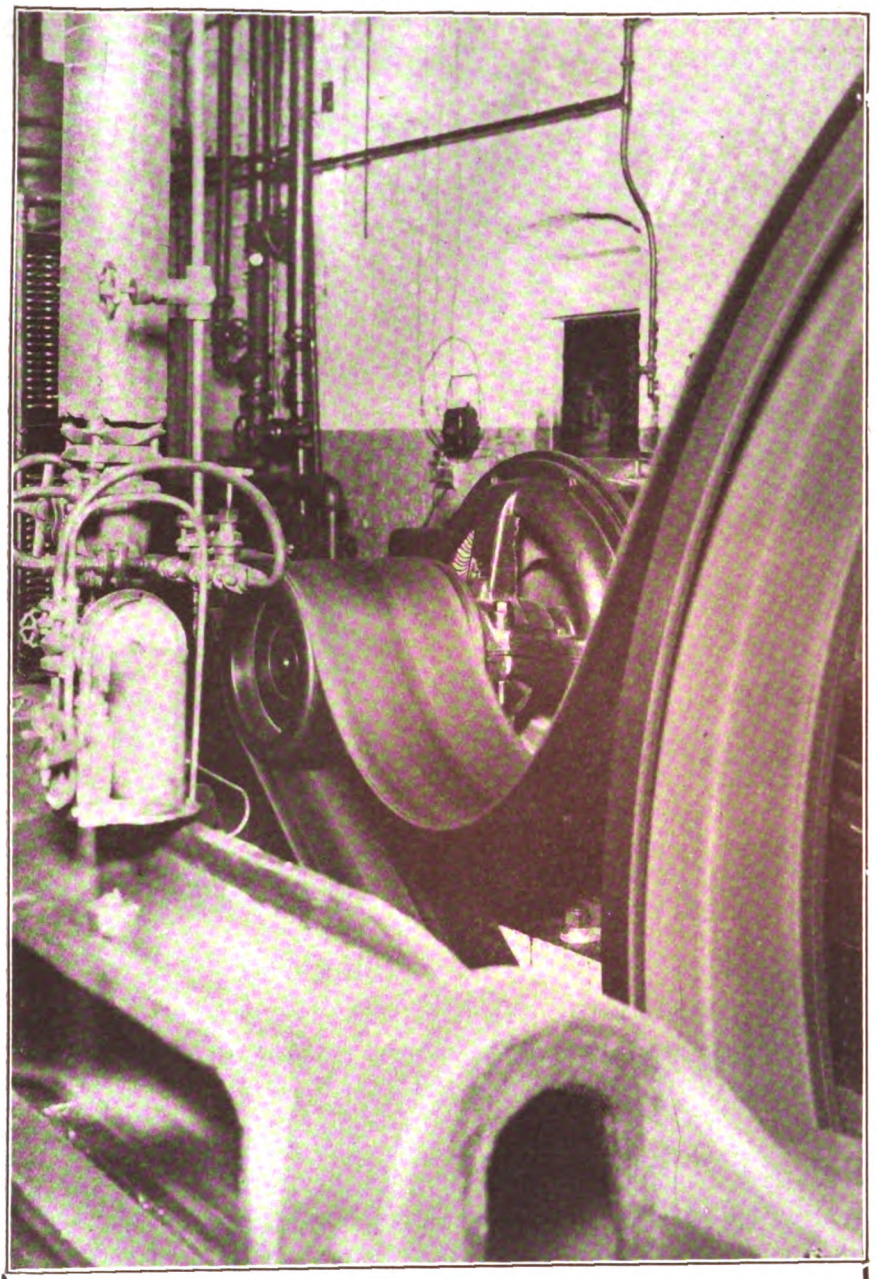
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This belt is in the Galesbury (Ill.) Artificial Ice Co. It has been treated for two years. It is 16½" face, 2 ply, driving an ammonia compressor; the pulleys are 12′ and 17", 75 and 570 R.P.M., and *the centers are just 10'*

That means that there are only 40" between those pulley faces, but in that space there is 34" of slack in the belt. The load is 125 H. P., which is 15% overload.

Previously a 350 pound tightener was used on this belt, but now it never slips even though the by-pass is rarely used.

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For 25 years Cling-Surface has done this in every part of the world. It is a real preservative, not a sticky belt dressing; contains no resin or other harmful elements.

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You can get a 25 or 50 pound package on approval, to be paid for only if satisfactory.

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Cling-Surface Company

1052 Niagara St Buffalo N Y

(*Continued from Page 58*)

where they would be apt to do damage and then soak the hickory to 'em!''

''But those men have been with me for years,'' remonstrated the other. ''Why I know them as well as I know intimate friends.''

''That don't make any difference,'' said the other happily, ''we'll either break them or you. They can't get away with it without a fight.'' He playfully swung his club in the air.

''But I don't want them to fight,'' said the shop-owner earnestly, ''I feel that the men are mislead, and do not understand, and that the affair can be settled satisfactorily by appealing to their reason.''

''See here,'' said the other, sticking out a heavy chin, ''They're only a lot of mutts, anyway. What they need is the club. Give 'em hell, that's the way to treat 'em. You take it from me, that's our business, helping firms to beat up their help 'till they ain't able to stand. The way to treat them fellows is to knock 'em cold, and then drag 'em back to the shop and kick 'em to work. That's our method. They're only a bunch of dubbs, anyway!''

''That is just what the organizer says, said the other blankly, ''but they are not. They are men who have worked here for years, some of them, and men who have a right to their opinion, however it conflicts with their interests. I want to reason with them, not try and force them.''

''We'll kill 'em!'' exclaimed Force gleefully. ''Set your price for each head cracked an' we'll lay 'em out in windrows!'' He dodged in time to escape an inkwell, and jumped through a window just ahead of a wild swing of the enraged shop-owner's foot.

The troubled man returned to his desk in time to hear a firm, assured voice speak his name. He turned at the hail. A quiet, sensible appearing man stood unwavering in the center of the room. ''And who are you?'' he asked wearily.

''I am common-sense,'' answered the other.

''Are you needed here?'' asked the shop owner. ''I guess you are,'' he added; ''if anything is to save us it will be something along your lines. What can I do for you?''

''Answer a few questions, and listen to what I have to say.''

''Very well.''

''First, you have developed this concern. It is your force that is producing the goods which you must market in order to continue running. Due to deflation and altered market conditions you have been forced to cut wages and change working conditions. In other words, your force are doing their share of the adjustment period. At the present they are being overcharged by local merchants and landlords. The same classes live by reason of your own creation and progressiveness, and the industry of your force. Still, they are maintaining prices where your men cannot meet them from the wages that must be paid if you are to meet competition.

''They feel that they are abandoned to the profiteers, and that their welfare is of no consequence to either you or other manufacturers. They know that things have changed and that conditions must be adjusted. They estimate your adjustments by the prices charged by those who are refusing to do their share. Your men have been cut in an attempt to meet these altered conditions, yet your local barbers and cobblers, a small item to be sure, but one noticeable and galling in view of the drop in hides and supplies, as I say, they are charging the same prices as during the war. Rents are the same, or mounting; professional services are almost beyond reach, and yet these classes live simply because you have established a creation that gives employment to hundreds of men, and it is their remaining entrenched in their high prices that have given rise to an agitation for a strike. In other words, the men blame you for the shortcomings of others!''

''But I did not know of this!'' exclaimed the astonished listener.

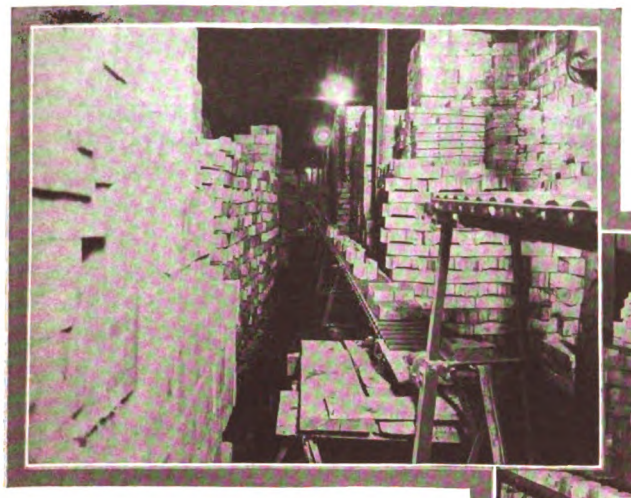
''Don't you have any shop meetings, or councils?''

''No.''

''Well, if you did you would hear these things, and you would know why the men are receptive to strike talk. They know conditions are what they are, from their viewpoint. They are told the reason why by agi-

(*Continued on Page 63*)

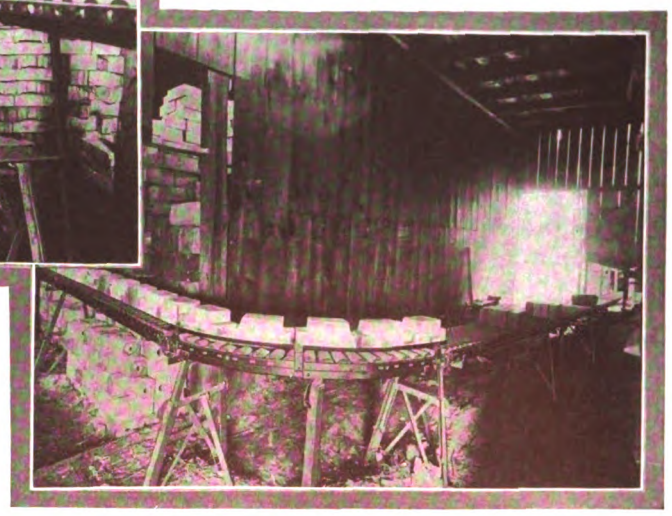
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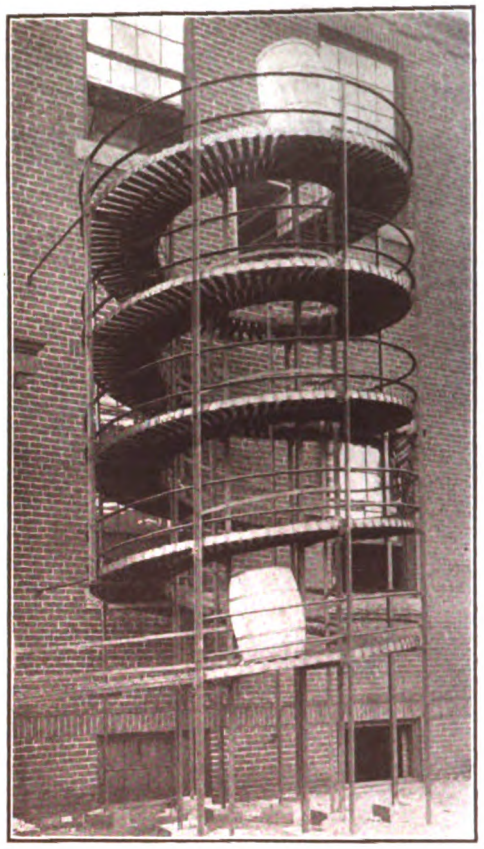


LEFT—Conveying brick for furnace lining at plant of Cambina Steel Co.

RIGHT—Barrels descending Gravity Roller Spiral.

CENTER—How Aluminum "pigs" are handled by Aluminum Castings Company.

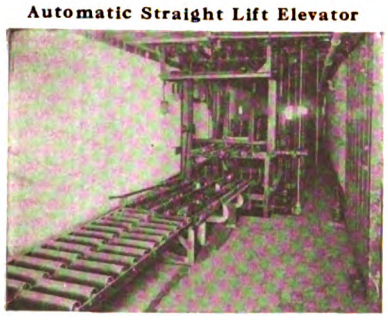




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Time lost and steps wasted always mean high costs, whether the waste is unintentional or otherwise.

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Where production involves many operations on a large number of parts, the loss is increased at every handling. The total waste figured in terms of payroll, is a staggering sum.

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Our nearest engineer will gladly work out a plan for applying modern handling methods to your business. Ask to have him call, or write for illustrated catalog--today.

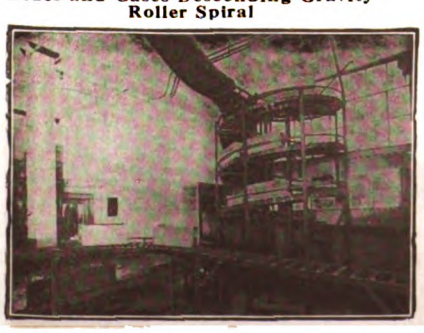
Conveying Apples by Gravity in Pacific Coast Packing House



MATHEWS GRAVITY CARRIER COMPAMY
157 Tenth Street, ELLWOOD CITY, PENNA.

MATHEWS
SPEED ECONOMY
GRAVITY ROLLER CONVEYER

Boxes and Cases Descending Gravity Roller Spiral



Baskets of Merchandise Descending Metal Spiral Chute



Conveying Lumber from Cars to Storage



Double Roller Self-Centering Conveyor



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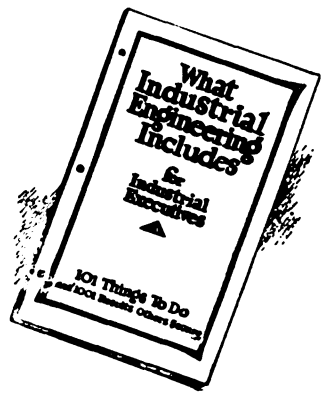
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(*Continued from Page 60*)

tators. They must accept their logic, or determine the question by their own thinking, which is liable to be warped by the unusual condition of the present. They do not know the employer's viewpoint, nor the economic truths that could be established by a direct enlightenment from their employers. By shop meetings, in which those questions could be discussed, you would create a feeling of confidence on their part. That their problems are yours; that yours must necessarily be theirs if they are to have employment, and the business to succeed. As it stands now, they know nothing of these things except that which is told them for the sake of creating confusion and loss, in which both you and they must suffer."

"But I had a meeting with them this morning, and I know by their actions that they will still strike."

"What did you tell them?"

"I summed up the advantages that they enjoyed in the plant and told them that I could not at present change existing conditions."

"You told them from your viewpoint, but you failed to get theirs. The fact is, that what you may consider advantages may appear to them as so much talk that is very transparent!"

The other sighed. "But what can I do, then," he asked. I feel assured that our plant is conducted along the usual lines. I never heard these things from the men?"

"Shop councils," droned the other.

"That sounds good," said the other, after some thought. "I will get busy on that suggestion. We have a score of men in the shop that have been with us for years. They would make good material for such an innovation as you have suggested."

"About what per cent of the force are these men?"

"About fifteen."

The other roared with laughter. "What you want in your councils," he said earnestly, as soon as he could control his emotion, "is a large proportion composed of that eighty-five per cent. Your older men have become a part of your plant. It is the element that are liable to change; that have been around in other plants and seen different methods of work; those that cost money to break into your particular line; those that are more or less radical, that will either relieve themselves in a council to your and their own interests, or else agitate among their shopmates; in a word, what you need to use is a bit of thought throughout all. You have the interest of the force at heart, but you have overlooked the fact that you, yourself, are capital, and the men under you, from the highest executive down, are labor. You realize that both labor and capital are team-mates. It is you, yourself, who must see that friendly, team-work spirit is installed. It can not be placed in a shop by paid performers, and it will not remain if the men are not understood and considered. Organize your shop council; attend the meetings, and talk to the men. Eliminate the foremen from those meetings. Meet the foremen as foremen, the men as employees, and after you have had your say, get out. Let the men discuss events with an executive high enough to be above petty feelings. Don't forget that an employee can suggest anything in efficient methods of work, changed conditions, or in fact anything outside his direct task without treading on some one's toes. That is all." He was gone.

"Well," thought the owner, "that is something, at any rate; but that does not avert the strike, and—" He was interrupted by a light laugh, and turned to see a cheerful appearing youth standing at his side.

"And you?" he inquired.

"I am loyalty," said the youth proudly.

"And you think that you can avert the strike?" asked the other; "and after what I have heard. Why, so far as I know, we never made any direct effort to create loyalty among the men. In fact, I never thought it necessary."

The other smiled. "There will be no strike," he said convincingly.

"But I tell you that we never attempted to win loyalty," said the shop owner; "how can it exist?"

"But it does!"

"No," said the other sadly. "It can't. I recalled the advantages of working in the plant when I had the men be-

(*Continued on Page 64*)

The Needle In the Haystack

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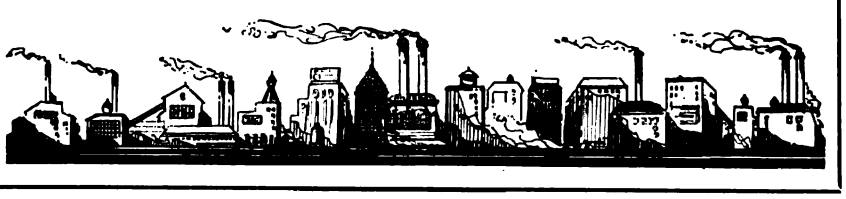
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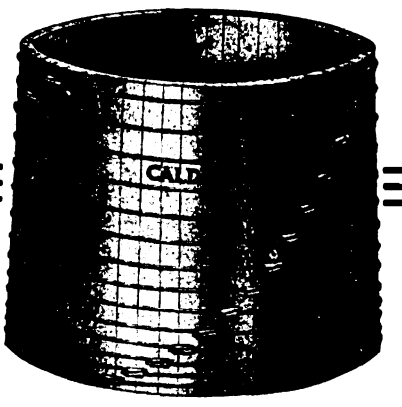
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fore me this morning, but they went out indifferent, and I know that they are determined to strike!"

"Loyalty lies deep," said the other seriously, "and at times it may seem slow in arising, but it is there in earnest when present at all. In this case it is there."

"But how?" insisted the other.

"By reason of John Jones; Brown and his family; by reason of several men who required legal advice, which was furnished by the main office; by reason of several men who wanted material for odd jobs around their homes, and were sold the stuff in a helpful spirit; on account of the plant furnishing coal during the shortage; on account of one or two men who were treated for ailments at the hospital, and were gladly given the use of the firm's wards; on account of a few men being given permission to have all the fire wood they wanted from the concern's scrap lumber; by various other little things, too numerous to mention, such as favors done the men by various foremen and executives. In fact you might simply say that considerate treatment of the men's problems by those above them did the trick."

"And that will discount the other shortcomings; the lack of understanding of the men's viewpoint, and misunderstanding of industrial conditions?"

"No. In this case, yes. Fortunately you happen to have been considerate of the little problems that come under their notice. This has been enough to create loyalty among a sufficient number of employees to forestall a strike on the part of those who have not directly benefited by this spirit of helpfulness."

"And that feeling of loyalty was created during the day's work, and without any deliberate welfare schemes?"

"Yes. It was created by the foremen; the men coming directly in contact with the men. You would harbor a grievance against any public service corporation whose employees were discourteous and domineering. Regardless, of the genial, whole-souled men who might be at the head of the corporation, and whom you never meet, you would judge them by the acts of those they employ. Your foremen are your conductors. Try and create loyalty, and the wrong type of foremen will smash it before it is born. The understanding type will create it unconsciously. They create it because they are proper men in the position. Given the executive who demands this latter from his foremen and you will maintain loyalty.

"Loyalty is closely bound with the men's problems. Meet them in council and learn their troubles. They can not do efficient work when mentally upset, or when nursing a fancied grievance. In order to get either out of their minds they must have some one to discuss the matter with, and some one in whom they can place confidence; some one whose interests are bound up with theirs.

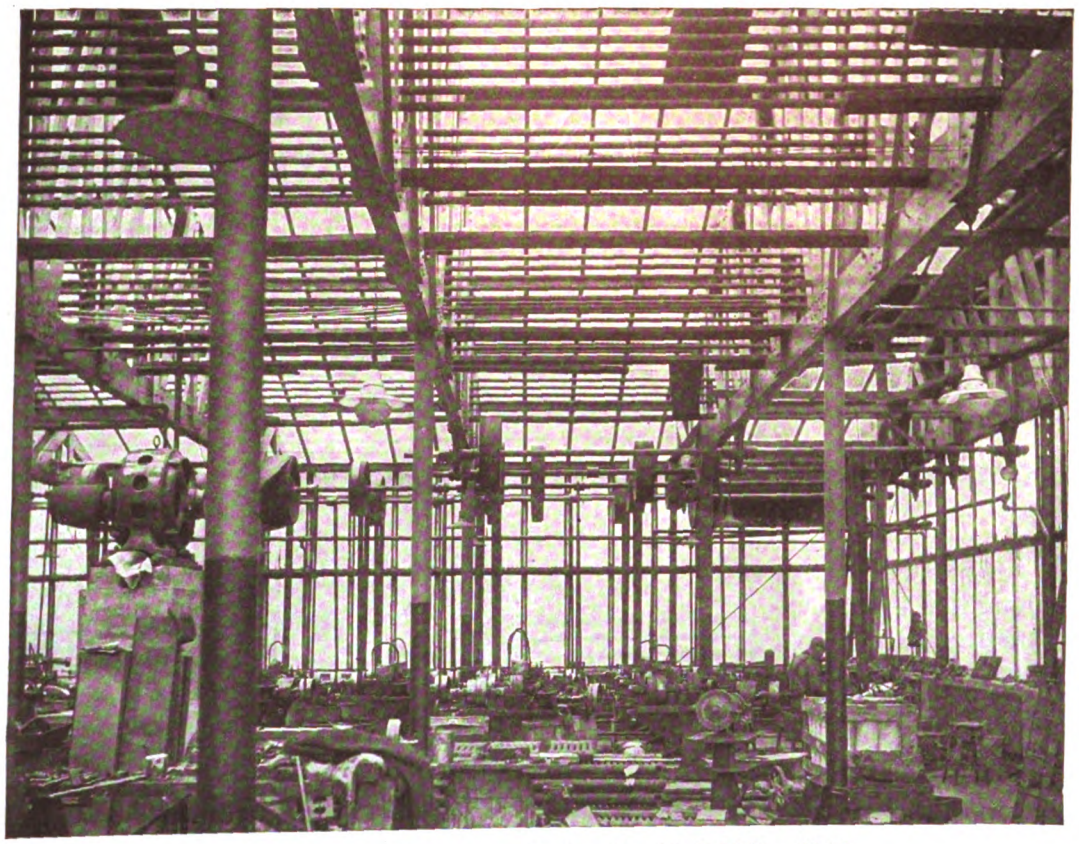
"The agitators have told them that *they* are right. *You* have said nothing; but loyalty, created by acts of kindness has proved its worth. There will be no strike!"

The smiling youth left the room whistling, leaving the thoughtful shop owner rubbing his eyes.

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How good is Ben Scott, operator, at penmanship and arithmetic?

When he has something tangible before him, a machine with a job to set up, his mind and hands function perfectly.

But when he must figure the elapsed time for some job, and when he must put the figures down on a job ticket, what happens?

His mind refuses to work. His fingers cramp about the pencil stub. After some minutes he makes a guess and his share of your "accurate record" is done.

When his job ticket reaches the timekeeper it is a scrawl, often smudged from oily hands, beyond recognition.

And the loss to you?

It is threefold---the time of the machinist, the time of the clerk and the accuracy of your records.

The Calculagraph shows at a glance time started, time stopped, and the *elapsed time,* right on the job ticket. Wherever elapsed time is a factor---in big factory or small shop---the Calculagraph quickly pays for itself as a saver of time and money.

The Calculagraph Way

One backward-forward movement of the right-hand Calculagraph lever when the job starts, a pull on the left-hand lever when the job is done, and the time record is complete.

The elapsed time can be read directly from the card, without any figuring or possibility of error.

One model prints the elapsed time in hours and minutes, another type in hours and tenths of an hour. There are also different models for computing elapsed time for maximum periods of twelve, twenty-four, and sixty hours.

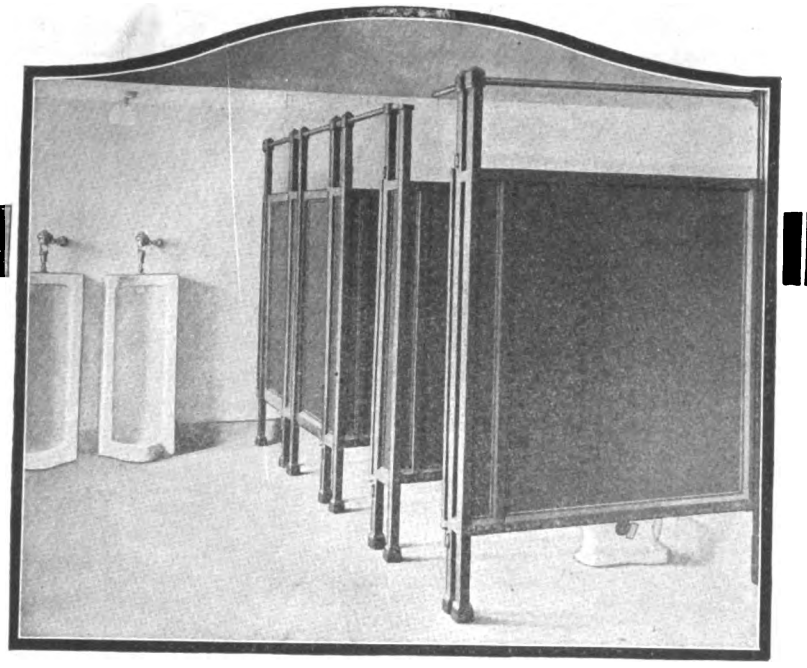
Any number of employees can use one Calculagraph without confusion of records.

THE CALCULAGRAPH

THE ELAPSED TIME RECORDER

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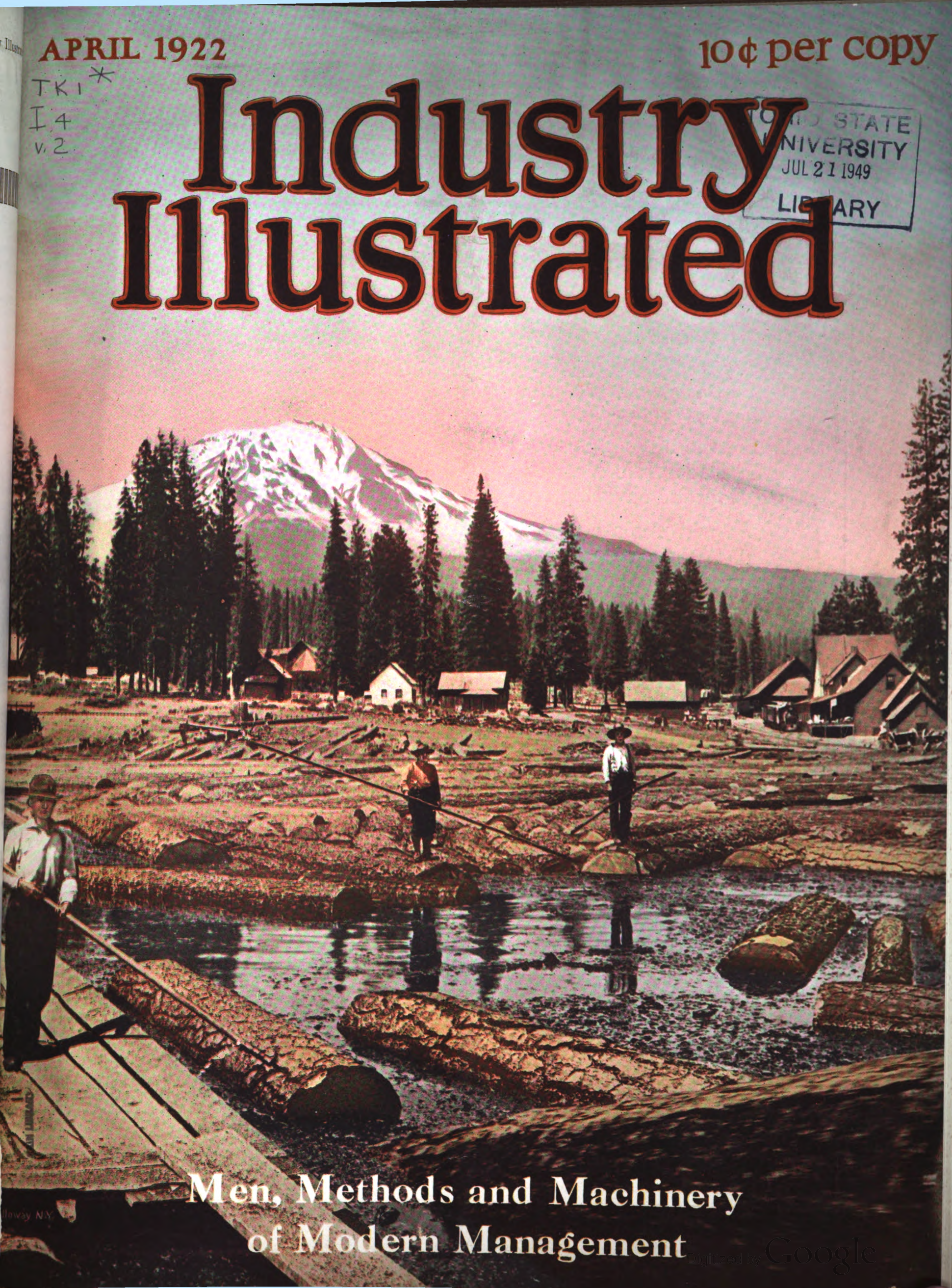
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Capable Hyatt Bearing Trailers Cut Handling Costs At Cedar Hill



Hyatt bearing equipped Lansing trailers that have been helping to reduce the handling costs at this busy freight terminal since November, 1920.

One of the biggest, best organized freight terminals in the world is the Cedar Hill Yard of the New York, New Haven & Hartford Railroad covering 1160 acres at New Haven.

In line with the other high grade equipment at this terminal are 320 Hyatt bearing equipped trailers that have been in continuous operation since November, 1920 with absolutely no bearing replacements.

A feature of Hyatt bearing trailers that makes them popular with the officials of this yard is the ease with which they can be moved by hand. The true rolling motion of Hyatt bearings enables one man to push any loaded truck into the cars, whereas two men are required to perform this work on the few plain bearing trailers around the yard.

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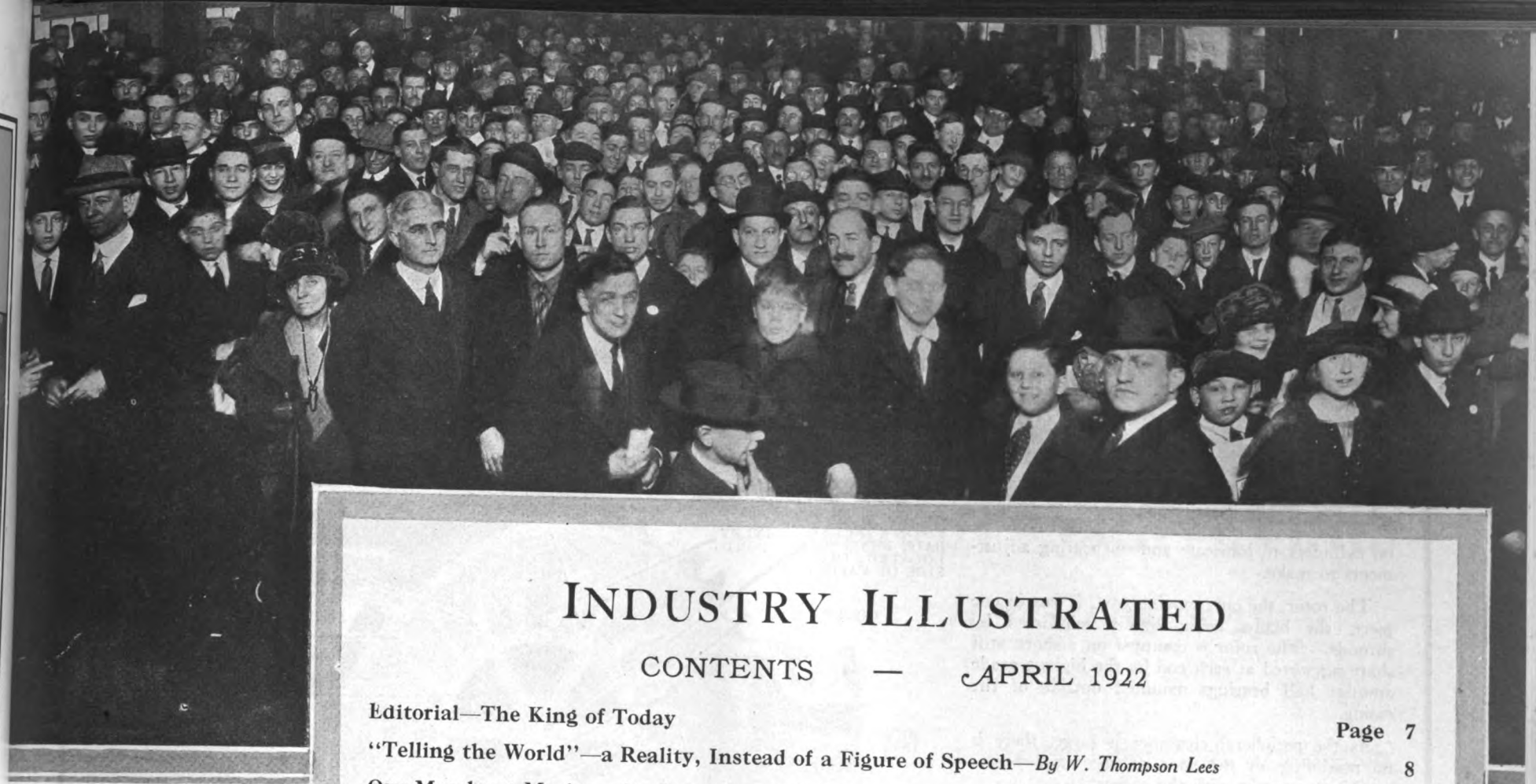
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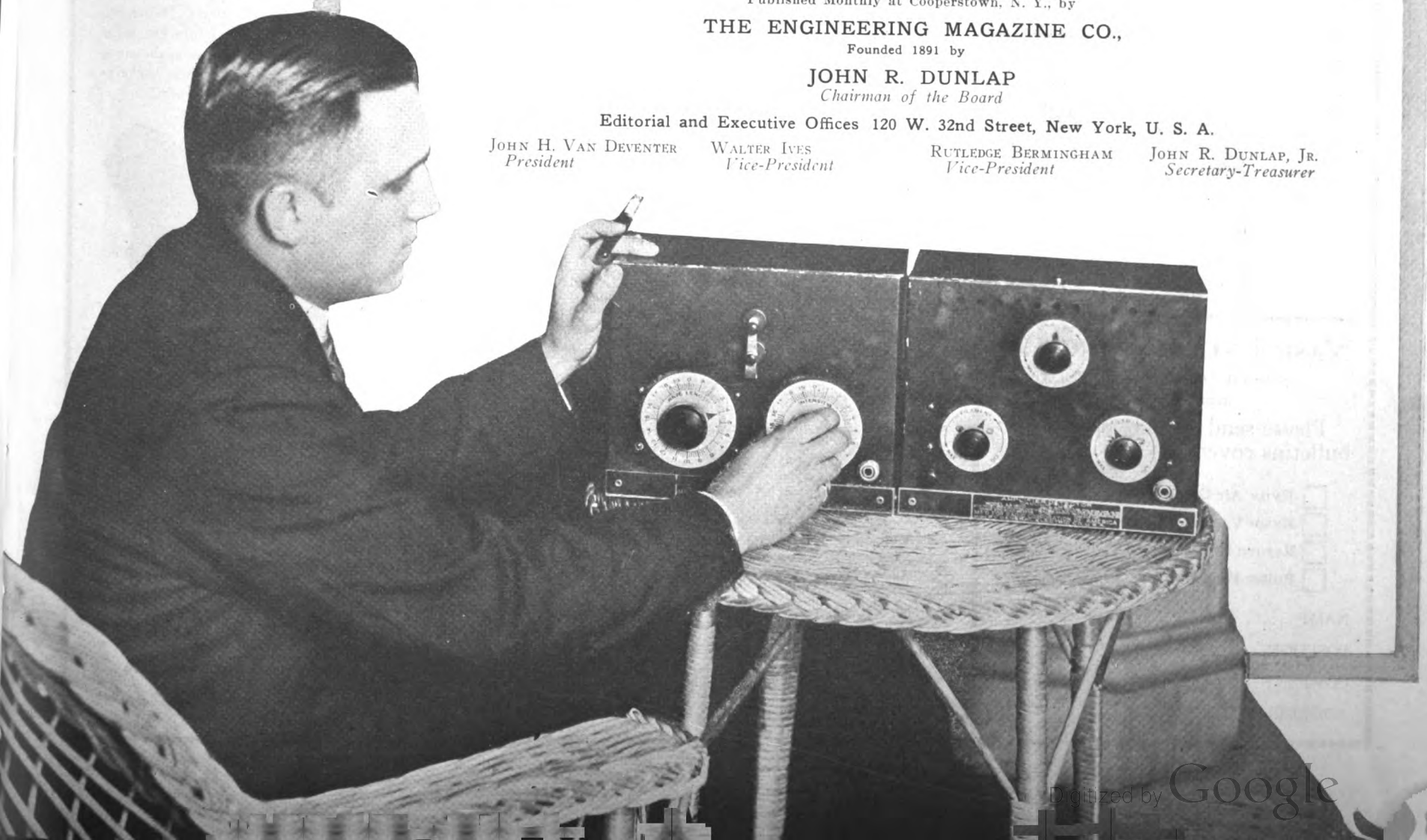
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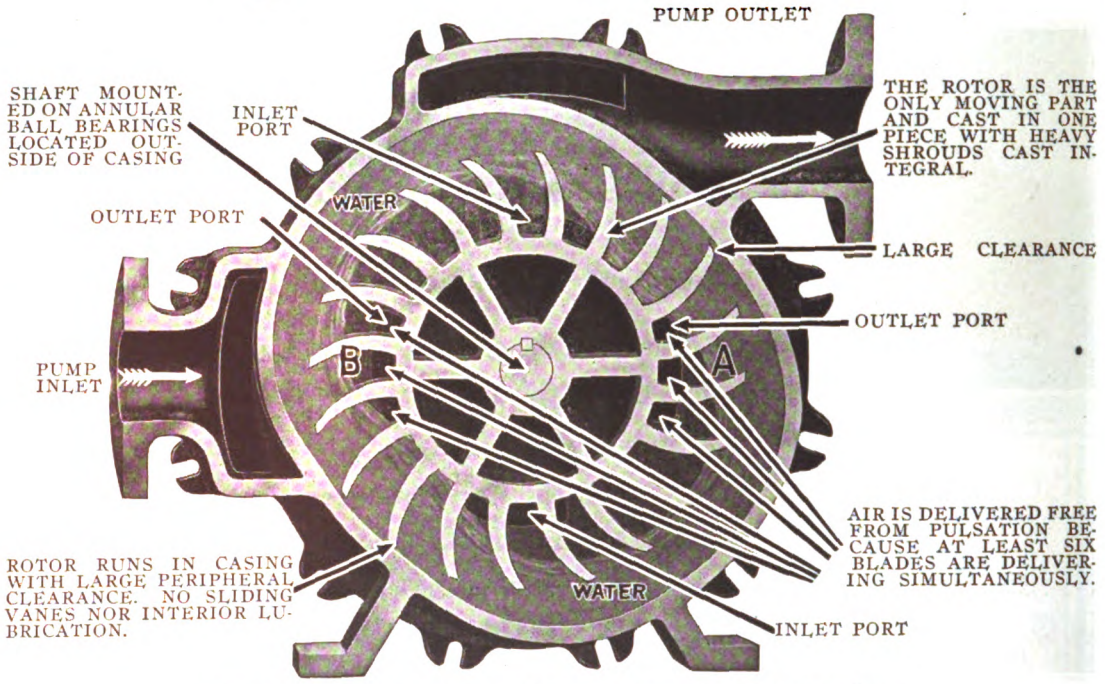
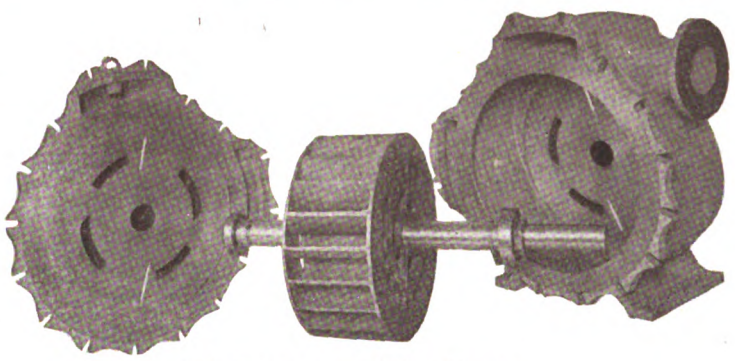


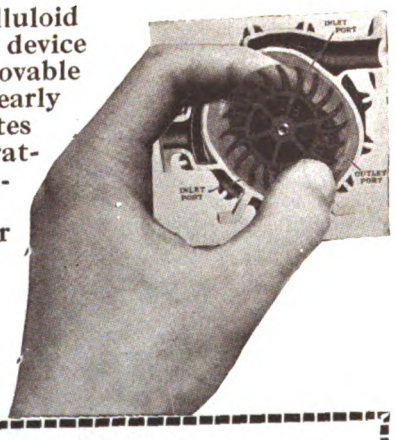
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All the parts of the Hytor

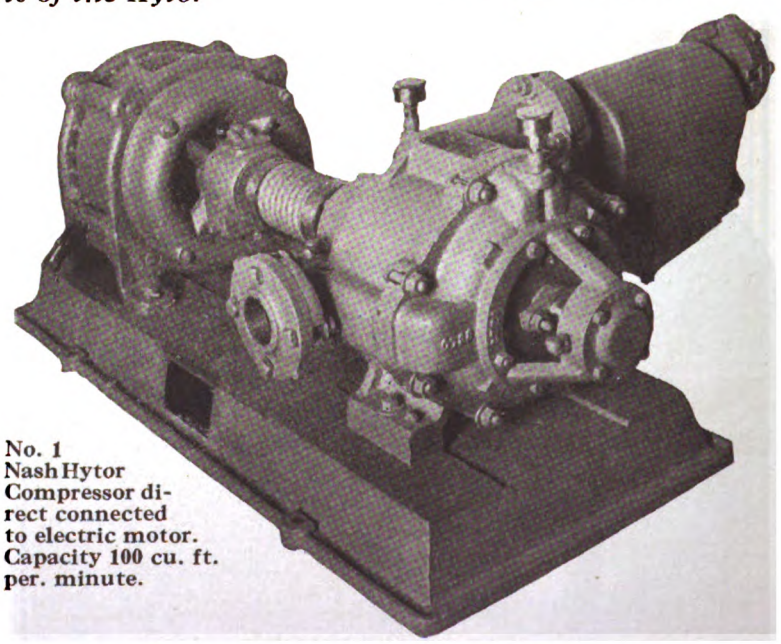
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- ☐ Boiler Feed Pumps

NAME.....

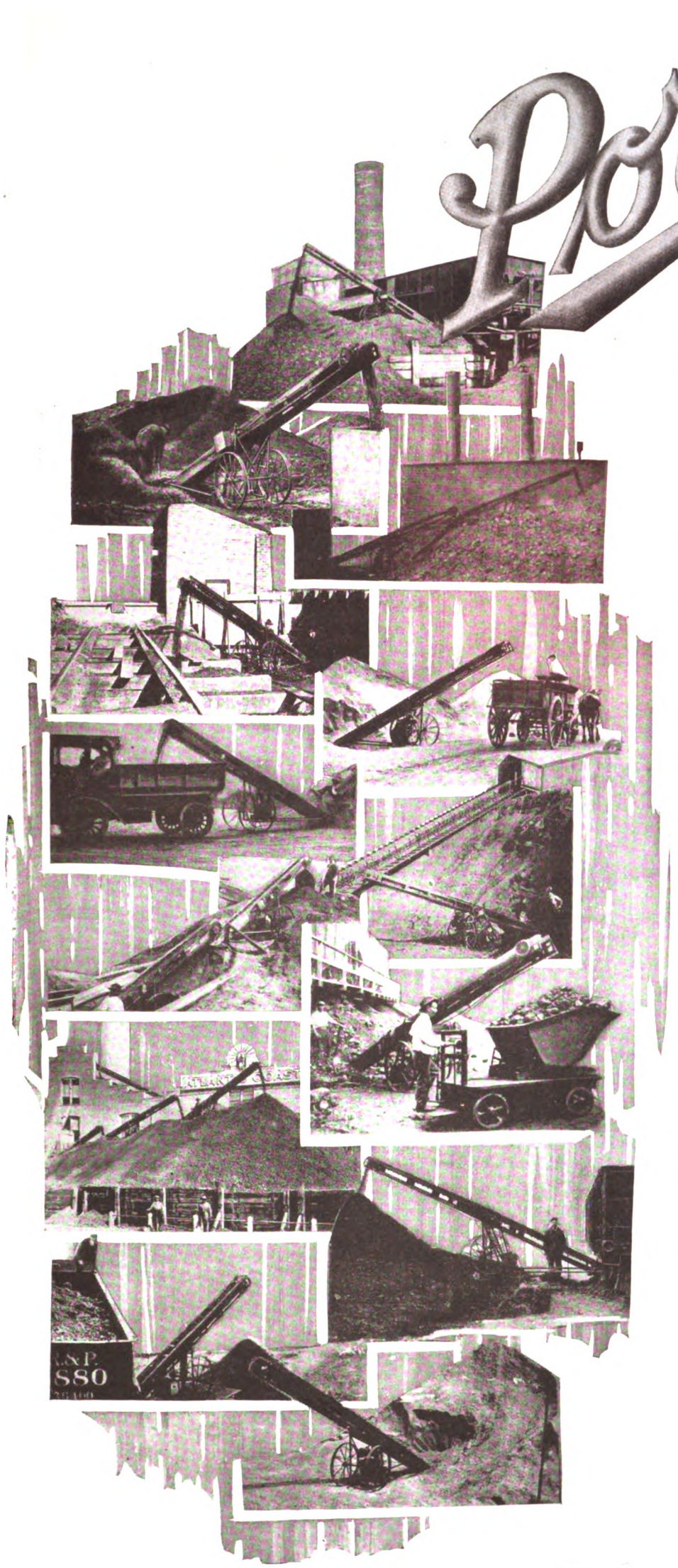
POSITION.....

COMPANY.....

ADDRESS.....

NASH ENGINEERING CO.
SO. NORWALK, CONN. U. S. A.

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SCOOP CONVEYORS

for Economy

THE unique design, the sturdy construction, the completeness of the Porta Scoop Conveyor assures reliable performance and economical long time service to every owner.

This light-weight portable conveyor is a complete answer to conveying problems at thousands of plants and its first and operating cost is but a fraction of the cost of a more elaborate, but no more capable, conveying system.

And what is more, you do not have to make expensive alterations in order to install a Scoop Conveyor. It is built in different widths and lengths and it is almost certain that there is a standard size which would ideally fit your particular requirements. There is no installation cost.

Our catalogue No. 63 shows how a great number of conveying problems have been met by this machine. May we send you a copy?

Portable Machinery Co.

Passaic, N. J.

PORTABLE MACHINERY CO. PASSAIC, N.J. U.S.A.

Ask Any User

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Uncommon Sense Applied To Advertising



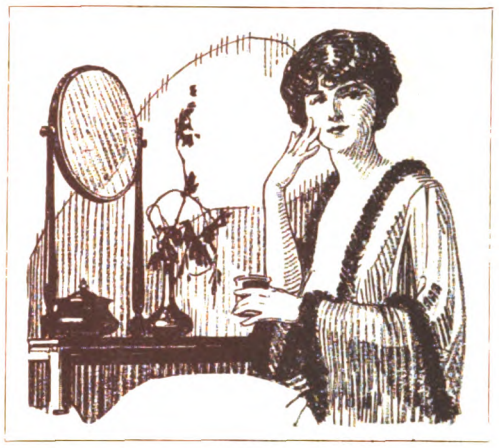
General Manager. Of all the jobs you ever wished on me that one of settling our advertising question is the worst.

President. Why, what's hard about that? I thought you intended to look up three or four advertising concerns, decide which one was best and leave the rest to them.

G. M. That was my intention, but after talking with a few of them I'll be darned if I can see how any of 'em can help us.

Pres. Well, why can't they? I thought these "advertising sharks" knew how to advertise anything!

G. M. So did I, but I'm not so sure of it now. Let me ask you something; would you hire a man to sell our machines because he'd been a "whirlwind" at selling "Darn-em-never" Hosiery or "Lasting Beauty" Face Cream or "Can't-Scratch" Garters?



Pres. Of course not — but what's that got to do with it?

G. M. Let me tell you about the advertising man who just left and then you'll see quickly enough. Oh, the boy sure could talk! He must have taken lessons of Bill Bryan, Bob LaFollette, Burke Cochran and all of the "silver tongued orators" we've had in the last twenty years. He almost made me believe that we would sell our machines to every "flapper" from here to Seattle if we could only let their man who put across "Knobby Klothes for Klassy Kids" write our advertising.

I asked him what "Get-a-shape" Corsets and "Silky Sheen" Petticoats had to do with a machinery advertising proposition; thought that might floor him, but it didn't. He was right back with something like this: "The underlying fundamental principles, the psychology of all advertising is the same whether you are advertising baby food or bridges."

Then he followed that up with a hifalutin dissertation on mental complexes and reactions, national consciousness and a lot of other highbrow talk that I can't remember. What I don't get though is how this "mental complex" and "national consciousness" stuff is going to sell one of our machines to a hard headed plant manager.

Wait a second there's the 'phone ---

"All right, send him in, I'll see him" ---



It's another of those advertising men, a fellow named Tyson; just stay and listen in and you'll learn for yourself what I'm up against.

How are you Mr. Tyson; this is Mr. Smithson, our President. Just sit down the other side 'the desk and tell us what you can do for us.

Tyson. Don't know whether I can do anything for you. Tell me something about your business first; how many types and sizes of machines do you make; how do you sell them; who buys them; what are they used for; go ahead and tell me everything you can think of about them.

G. M. What in the name of all the Ex-Kings of Europe do you need all that information for? Another of you advertising experts who was in here this morning said "Advertising is Advertising" and Claimed that if you knew how to advertise *one thing* you know how to advertise *anything.*



Tyson. Yes, and Ellis Parker Butler said, "Pigs is Pigs" but he found out that there are guinea pigs, razor backs and plain hogs. If you have anything from toilet soap to trundle beds to advertise it's out of our line, but we do know how to advertise everything from tote boxes to turret lathes. If it's any kind of an industrial or technical proposition we know how to handle it.

G. M. That's a new one on me. How long have you been at it?

Tyson. No, it's not new. We've not only been in business ten years but the first client we got after starting in business is still with us.

G. M. I'm beginning to see a "ray of light." We will gladly tell you all about our product, our sales problems and our markets but, while Mr. Smithson's here and before I take you out into the plant, I'd like you to tell us something more of your story.

Tyson. Probably the best way to cover that would be for me to show you what we are doing for other clients whose products are related to but not competing with your own. Then I'll tell you how we went about our investigations to get information of their products and problems vital to successful advertising. I'll explain to you how all forms of advertising, magazine, direct-by-mail, circular and catalog are inseparably correlated, and how all must be interwoven into your sales plans to secure

* * *

We're sorry, but big as the publisher made this page he didn't make it quite big enough to finish our story. A little book, small enough to slip into your pocket but big enough to tell the whole story, is now being printed. If you've read this far you'll probably want to see a copy. We'll gladly send it—or a half dozen if you like—write, 'phone or wire. Doesn't make any difference whether you are thinking of advertising or not—ask for as many as you may wish.



RICKARD
& COMPANY, INC.
PRODUCTIVE PUBLICITY
25 SPRUCE STREET, NEW YORK CITY

PRODUCTIVE PUBLICITY RS

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Industry Illustrated

John H. Van Deventer, Editor

W. Thomson Lees, Associate

Reginald Gordon, Associate

EDITORIAL

The King of Today

IN an obscure corner at the Centennial Exposition in Philadelphia in 1876, sat a young man who had devoted years of patient study and experiment to the model exhibited on a table in front of him. The crowds passed him by, with scant interest and less credence in the "toy" he was trying to bring to their attention.

The story goes, that on the last day of the Exposition, when the young inventor had despaired of gaining recognition, a Royal visitor happened to recognize in him a man who had interested him some years before. Stopping to speak a few words, the distinguished scientists accompanying him perforce stopped also, and were induced to examine the device, though skeptically. Thus, through royal favor, Alexander Graham Bell succeeded in gaining recognition for his epoch-making invention of the telephone.

Less than seventeen months ago, the Westinghouse Company at Pittsburgh broadcasted the first news event by wireless telephone. Less than a year ago, the first commercial station began broadcasting on a regular daily program. Already there are half a million receiving stations scattered over the country, served by a score or more broadcasting stations, and the number is growing every day. And this new science owes its swift recognition, not to royal favor, but to that infinitely more powerful force—the approval of the average man.

In ancient times, the man with a revolutionary idea sought first of all the favor of a princely personage, without which he could hope neither for reward nor recognition. In the Middle Ages, the man who thought beyond his time was far more likely to be imprisoned for heresy than to be rewarded; and the average man of that time had neither the education nor the independence to appreciate new ideas.

Every great and enduring invention or discovery, from the invention of printing to the discovery of radium, has been one more step in raising the average man to his rightful place as king. Electric lights, typewriters, sewing machines, fountain pens—the most commonplace conveniences at the disposal of the average man today, would have been accounted as marvels by those kings of old; yet, great as they considered themselves, they had none of the things which the average man of today considers necessities.

In science, in art, in business, no longer is it a matter of seeking royal approval. The final award of merit, the final reward for work well done—these things, today, come not from a king but from the average man. Whether it be a new invention, or a better product, or a new method; that thing is *best,* which best serves the greatest number of average men.

There has never been a time in the history of the world, when the man with a message could gain a speedier hearing than now. There has never been a time when he could reach so large an audience with so little difficulty. There has never been a time when this audience was more receptive to sane, progressive ideas; whether new inventions, better methods, or better and cheaper products.

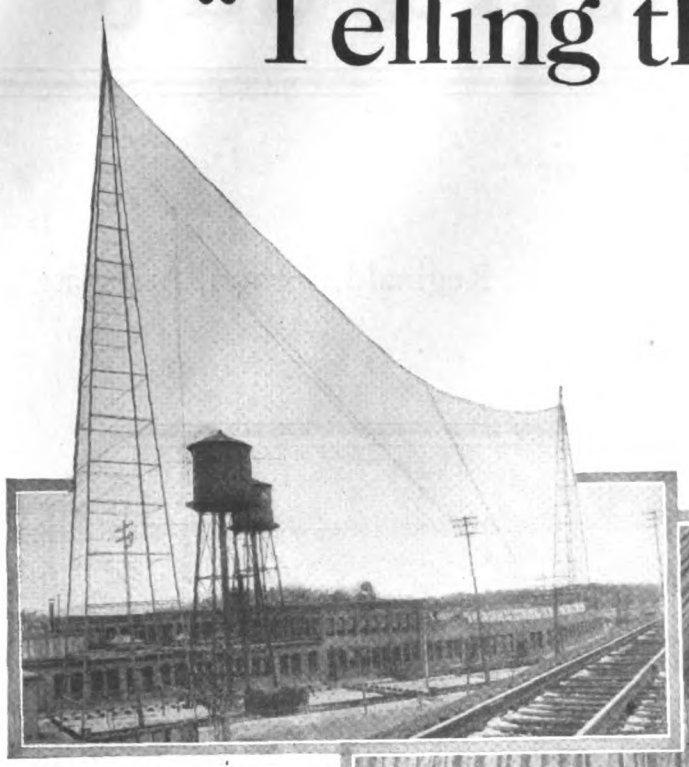
Additional copies of this Editorial will be furnished on request

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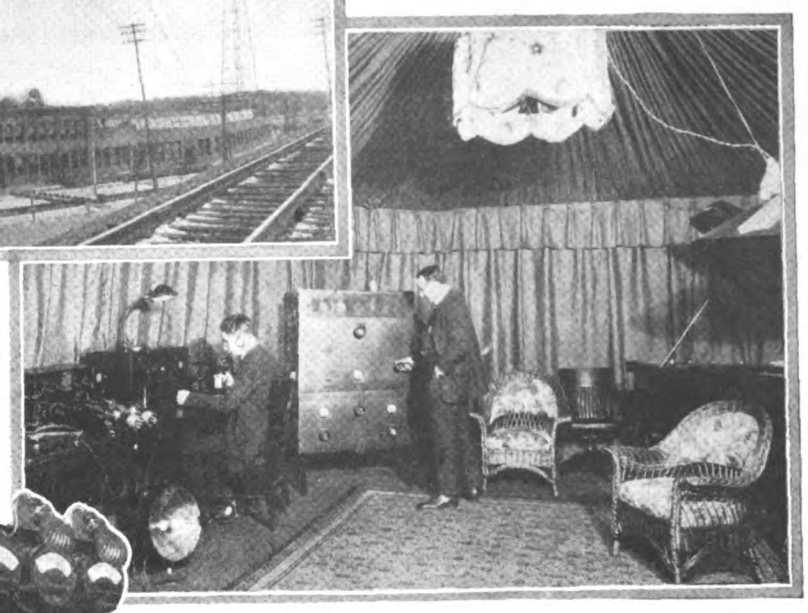
"Telling the World"--a Reality,

Radio Broadcasting, the Newest Science,

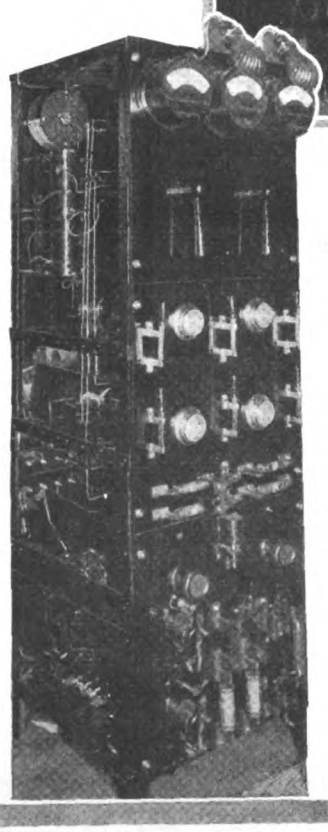
BY W.



Masts supporting the aerials at one of the broadcasting stations.



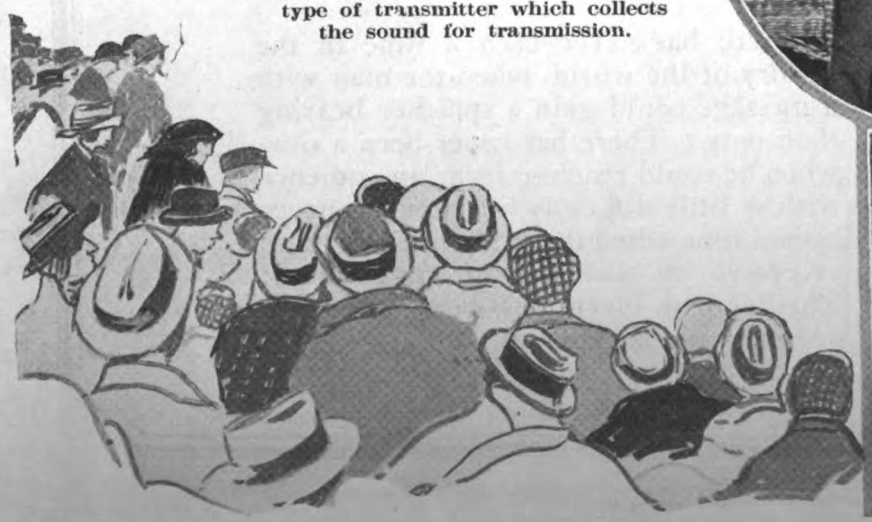
Interior of the room at Roselle Park, N. J. (now discontinued in favor of a more powerful station), where the actual sending is done.



At the left—complete radio sending apparatus as used for broadcasting.



One of the exhibits at the New York Amateur Radio Convention, showing a wide variety of receiving apparatus.



The singer stands before a special type of transmitter which collects the sound for transmission.

UNLESS you already know the meaning of "C. W." and "Variometre" and "Loose-Coupler"; unless you know who and where "KDKA" and "WJZ" are, you had better get busy and acquaint yourself with these things and many others of a similar nature, or be left high and dry in your ignorance.

The world has gone wild over the wireless telephone. Nobody who caught a glimpse of the crowds which stormed the recent Radio Convention of the Second District, at Hotel Pennsylvania, New York, will question that statement. Only the most persistent could get anywhere near the exhibits themselves, and it was necessary to close the entrance doors a dozen times in the course of the show, for very safety's sake.

What is this new thing—this "broadcasting"—that has suddenly swooped down apparently out of nowhere, and is making such a tremendous stir? Who started it; why didn't it come years ago; what are its practical accomplishments? Perhaps a brief outline of its history will help to clear up these points.

From the early days of Wireless Telegraphy, there have been small amateur stations scattered over the coun-

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Instead of a Figure of Speech

Whose Possibilities Are Revolutionary

THOMSON LEES

try. These stations were operated by enthusiasts who made wireless their hobby. To these amateurs, more than to any other one thing, Radio Broadcasting owes its remarkably quick growth: first, because many of the inventions and discoveries which helped to perfect the art, were the work of amateur experimenters; and second, because without an established audience already equipped with receiving apparatus, it would have taken years to arouse the general public to its present pitch of interest.

These early day amateurs, to get anything at all out of their hobby, had to be able to read the dot-and-dash code, because as yet there was nothing else being sent through the ether. Gradually, however, experiments in voice-transmission progressed; occasionally the listening amateur, tuning up his set, would pick up snatches of music or fragments of speech out of the nowhere. The costly apparatus and large power required for voice transmission, however, prevented the rapid spread of the newer and more universally applicable art. The only known means of producing the continuous waves ("C.W.") necessary for transmission of sound

(*Continued on Page 30*)



At the right—operating department at a large commercial broadcasting station.



At the left—crowds watching a demonstration of the wireless-controlled automobile, at the New York Radio Convention.

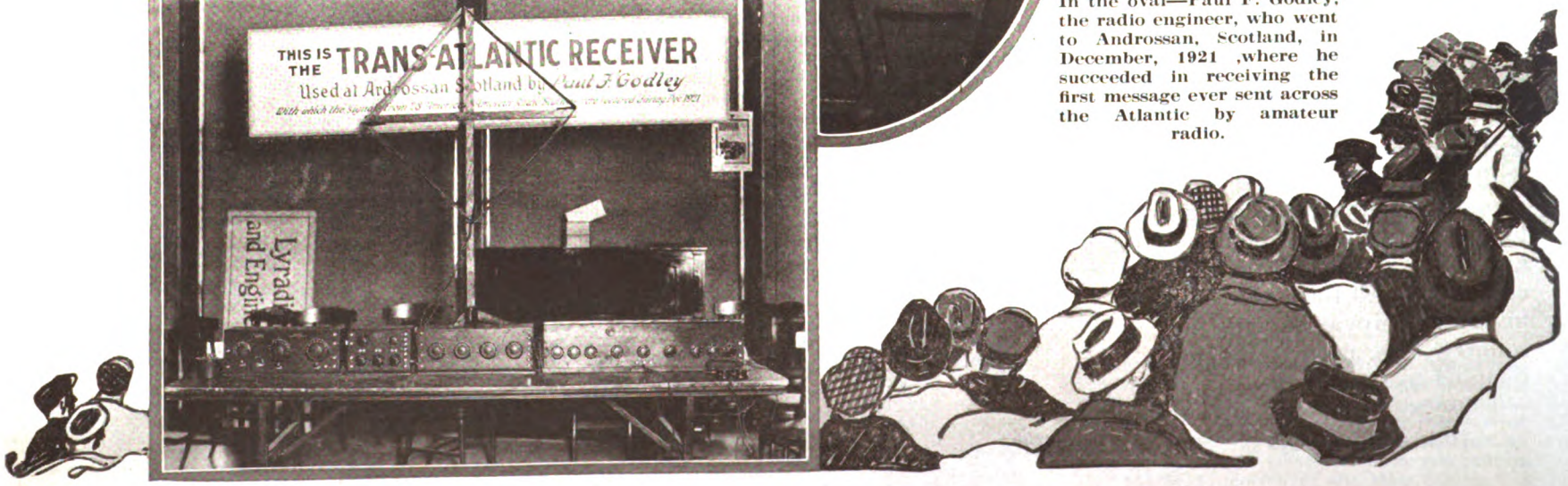
Below—the newest form of radio receiver. The cabinet contains both phonograph and complete wireless receiving apparatus.





Below—the installation with which Paul Godley made the transatlantic amateur wireless tests in Scotland.

In the oval—Paul F. Godley, the radio engineer, who went to Androssan, Scotland, in December, 1921 ,where he succeeded in receiving the first message ever sent across the Atlantic by amateur radio.



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Our Merchant Marine

An Interview with Frank Seymour Hastings

IT is only a little over half a century ago that the United States possessed a merchant marine second to none. Yet, at the beginning of the World War (the merchant marine of the world amounting to 43,000,000 tons) Great Britain's merchant fleet consisted of 18,900,000 tons, Germany was a close second, while America, with a paltry 2,000,000 tons, was far down the list.

As a result of the war's stimulus, the world's tonnage today is roughly 56,700,000; and whereas Great Britain has increased her tonnage to 19,300,000, the United States merchant fleet has grown from an insignificant 2,000,000 tons to the more impressive figure of 13,600,000 tons. In other words, today we are a close second (in the list of merchant fleets owned), while Japan, with 3,350,000 tons is third.

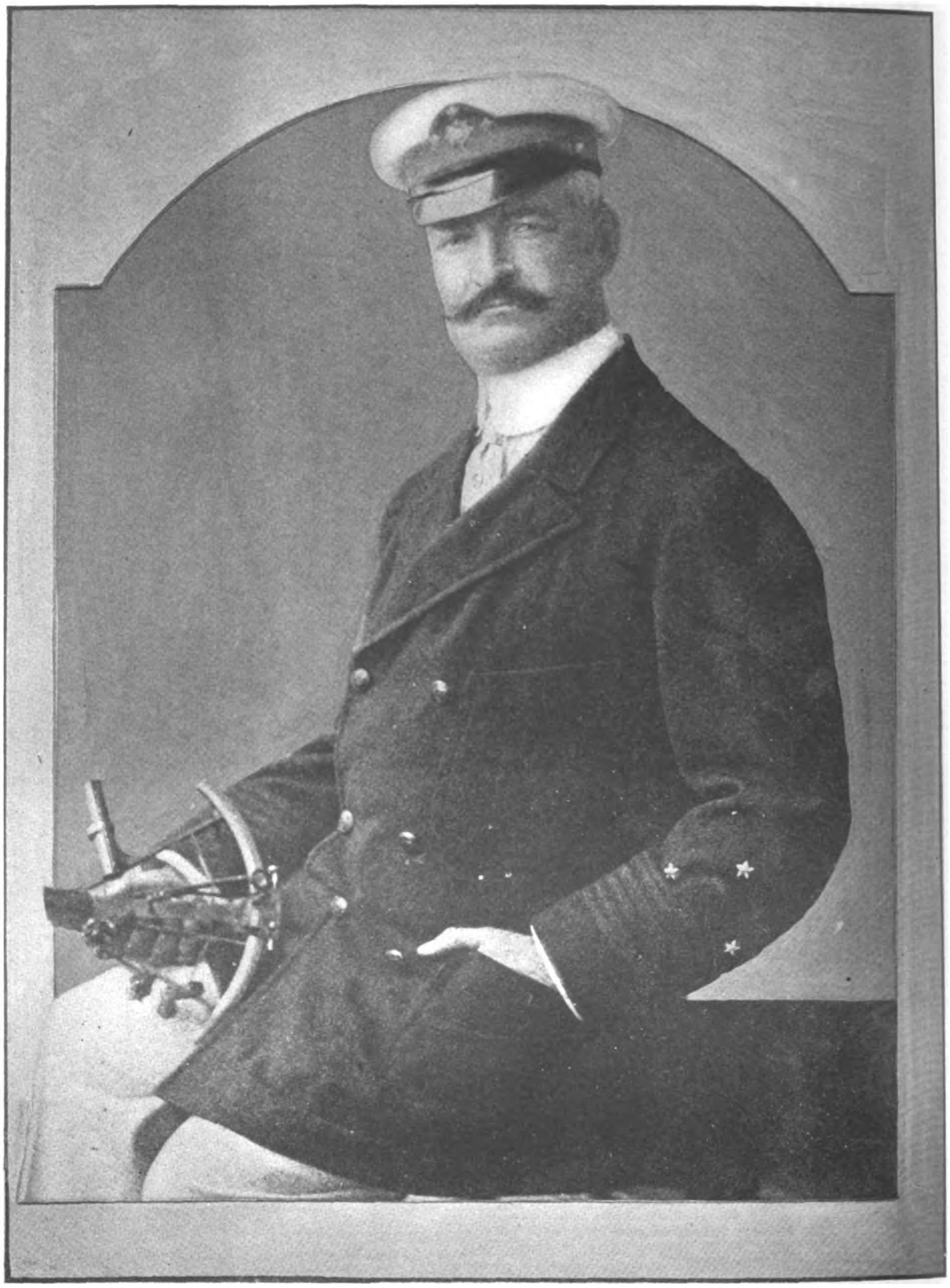
On the face of these figures, one would imagine that America is coming back to her maritime glory of some seventy years ago. Yet, the most cursory examination of the true situation fails to substantiate that idea. In fact, at the present time, not only are we far from being a real maritime power, but there are very strong indications that we are going to sink back to the same lethargic condition we were in eight years ago.

Of course the world's oversupply of ships and the unsettled conditions which demoralize foreign trade are factors against any immediate solution to the shipping problem. But these same conditions are not causing Great Britain to drop back from her leadership on the seas.

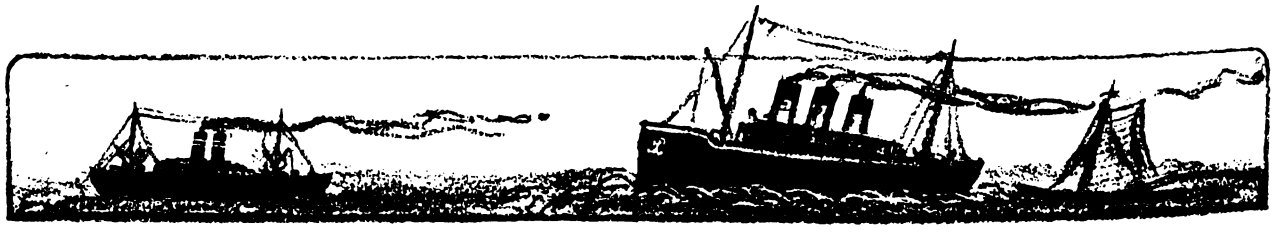
Is there any underlying reason why the United States, with innumerable harbors and with immense resources cannot support a merchant fleet equal to that of any other country; and why it is that all the fastest and biggest liners are built in foreign shipyards, while this country has never even attempted to rival them?

These were the questions we

(*Continued on Page 56*)



Frank Seymour Hastings has been interested in nautical matters from early boyhood. He studied deep sea navigation under the late Captain Howard Patterson, graduating from Nautical Academy with a Master's Certificate. Mr. Hastings has made many trans-Atlantic and West Indian trips as assistant navigator, and is a recognized expert in Nautical Astronomy. During the war, he was appointed head instructor in navigation on board the "Granite State," being later transferred to the great training camp at Pelham, where he superintended the classes in deep sea navigation. While there, he passed the Federal examination in the higher branches of this science and was made Commander in the Naval Reserves. As a yachtsman, he served eight years, as Rear Commodore and then Commodore, of the Seawanhaka Corinthian Yacht Club. His two books on Navigation were extensively used at Pelham and other schools during the war. Mr. Hastings' chief hobby is music, and besides being a composer of note, he is Chairman of the Oratorio Society, President of the Singers' Club, former President of the Russian Symphony Society, and was decorated by the late Czar of Russia with the Order (and as a knight) of St. Stanislaus.

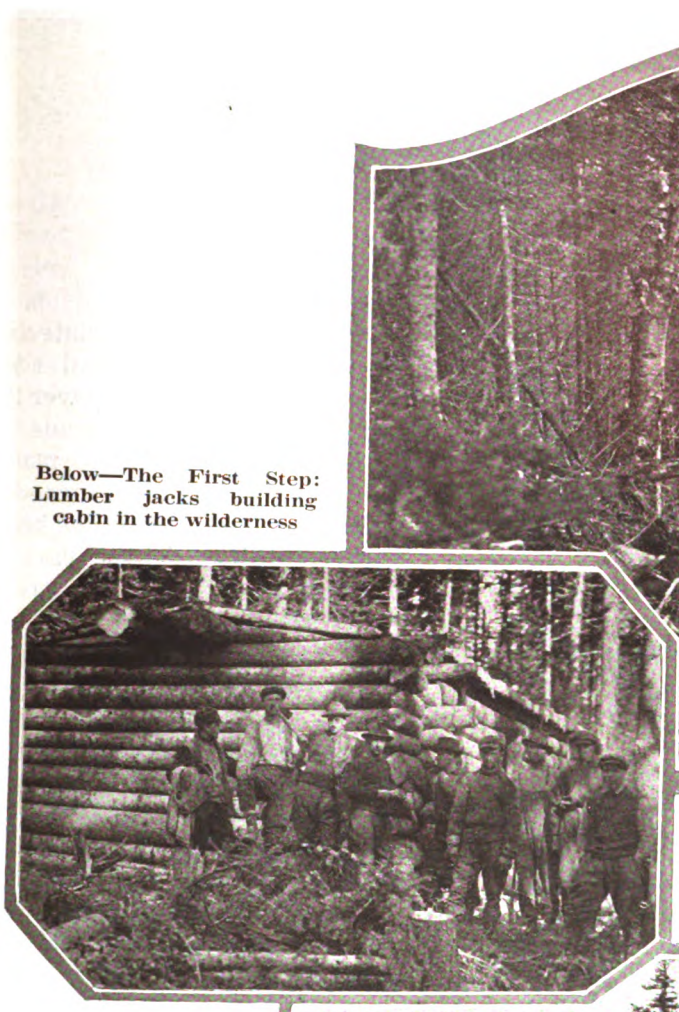


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Forestry and the Paper Industry

The Dwindling Supply of Raw Material Has Brought About a New Spirit of Coöperation in Forest Conservation

By Warren B. Bullock



Below—The First Step: Lumber jacks building cabin in the wilderness



A road into the dense forest, over which pulp wood will be hauled to the Gulf of St. Lawrence



A street of laborers' homes. They are built by the men with materials furnished by The Chicago Tribune



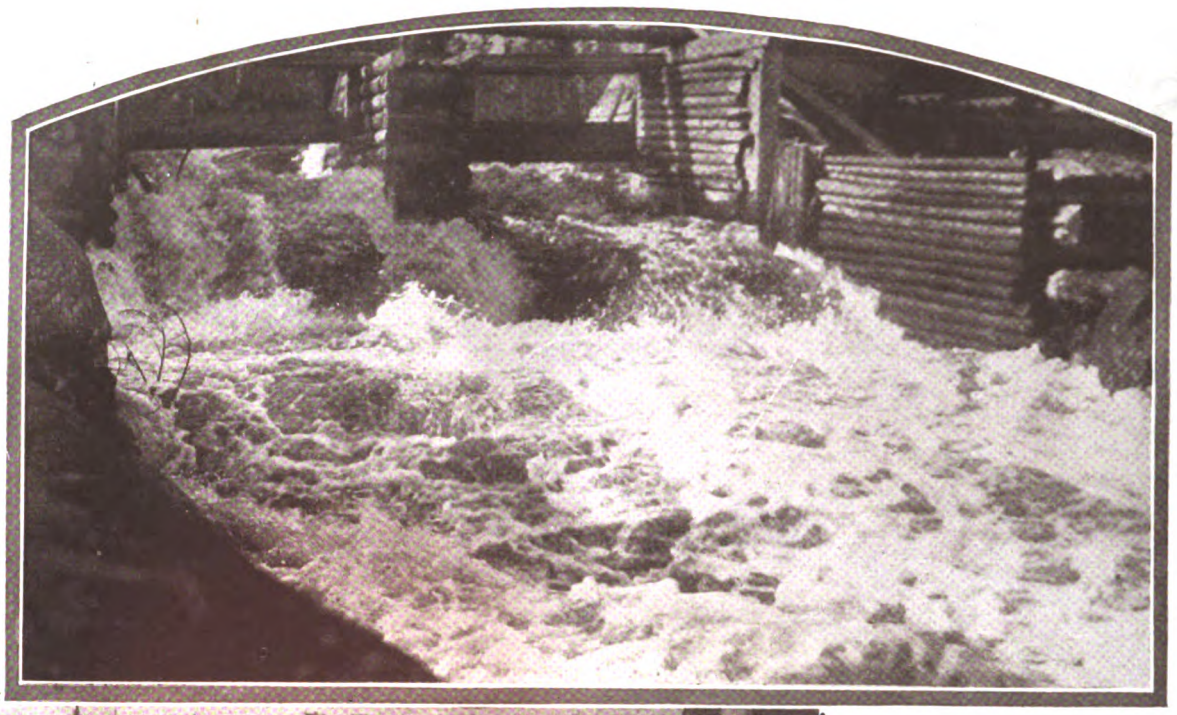
Log jam in the Franquelin River. These logs were cut in the winter of 1920, placed on the ice as cut and floated down by the spring floods. The dam now being built will keep this part of the river at such a level that these logs will be floating and can be taken out to the saw mill in any quantities desired at any time during the summer, making the supply independent of spring floods

THE forest is, in the last analysis, the greatest problem of the paper industry of America.

Labor, merchandising, manufacturing processes try the ability of an executive to the utmost. But back of all these, great problems though they are, lies the question of a continuous adequate supply of the raw material which his mill must convert.

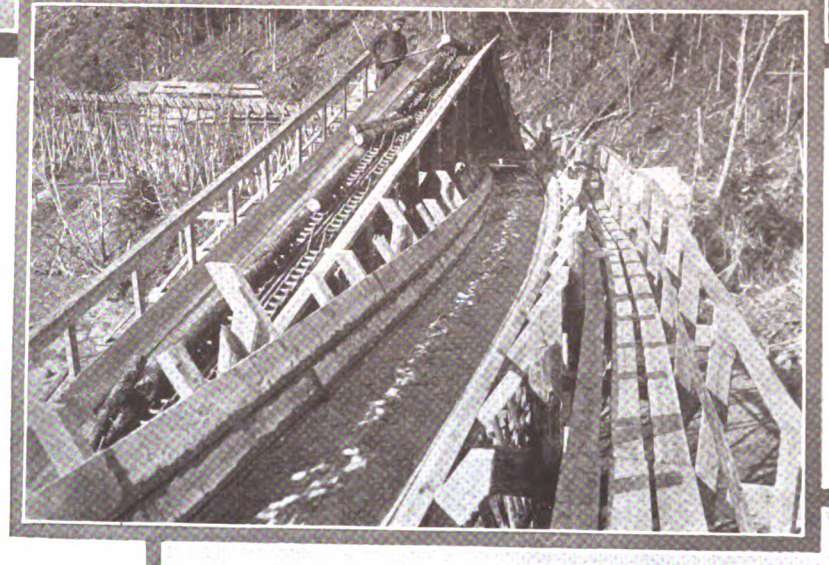
Paper, of a kind, can be made from any vegetable fibre, if the element of cost and quality of output is not to be considered. But experiments with grassy fibres, bamboo and similar substances have only served to accentuate the fact that the paper industry must look to the

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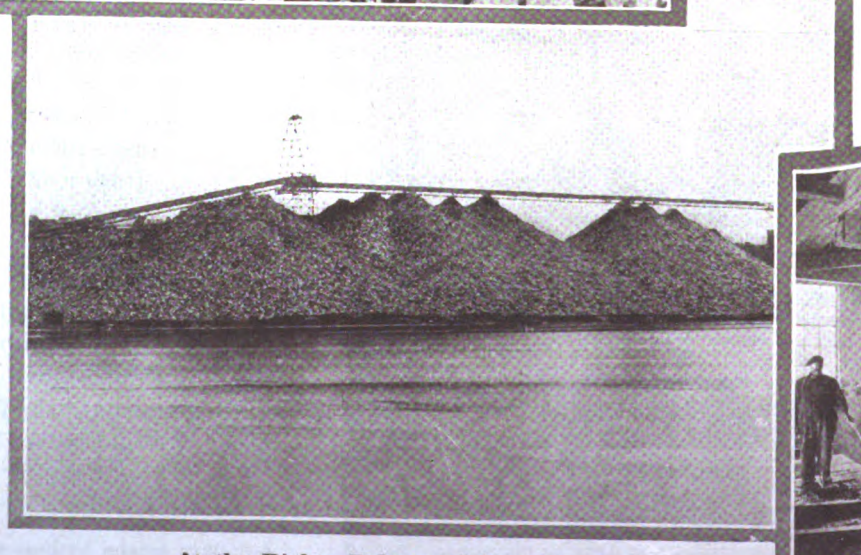
Dam in Rocky River six miles above the St. Lawrence. This dam has backed the water up for miles so that boats will soon be able to travel over 60 miles of waterway above the dam



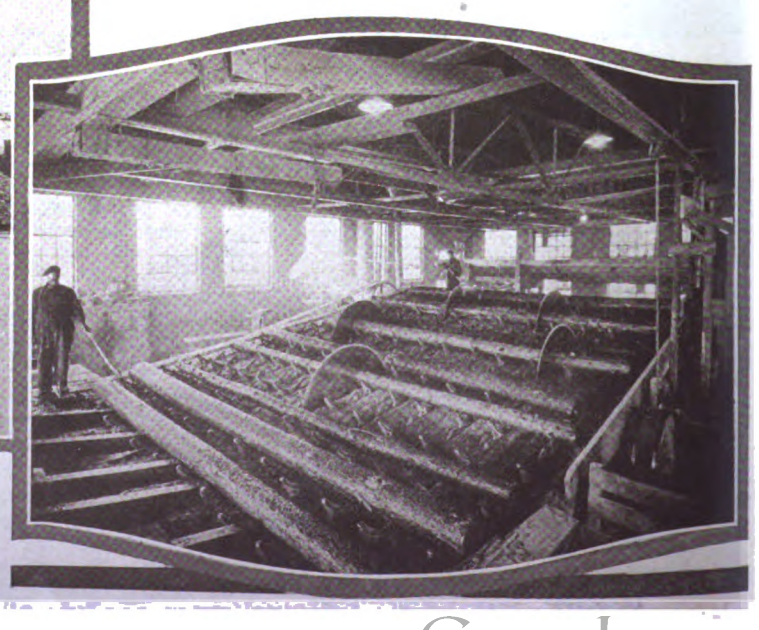


Pulp wood logs in booms in British Columbia, mill in background

This company cuts its logs into 4-foot lengths before shipping to pulp mill. Chain conveyor taking logs to sluice, which will float them out to docks in the St. Lawrence for shipment by steamer to the pulp mill



Pulp wood in storage piles waiting to be ground into mechanical pulp or cooked into sulphite pulp



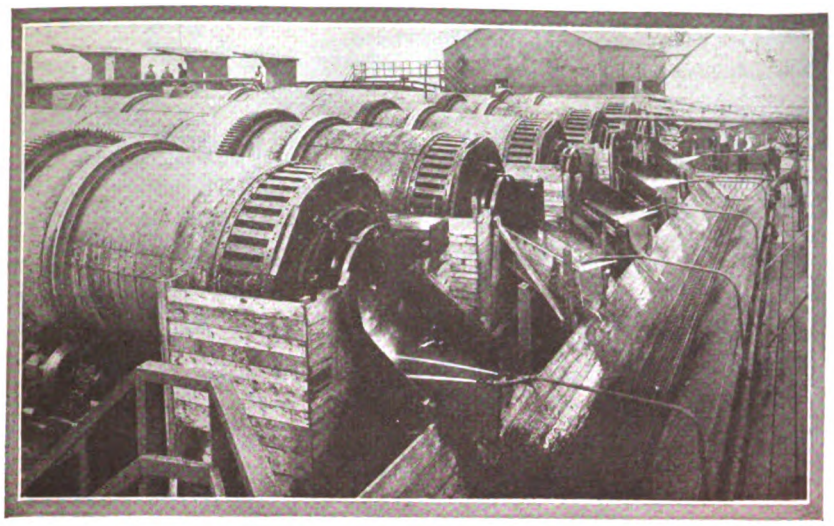
At the Right—Pulp wood logs being cut into short lengths for the grinders or chippers

forest for the type of material which can be converted economically into paper. Over 95 per cent of the paper made in the United States is made wholly or in part from wood.

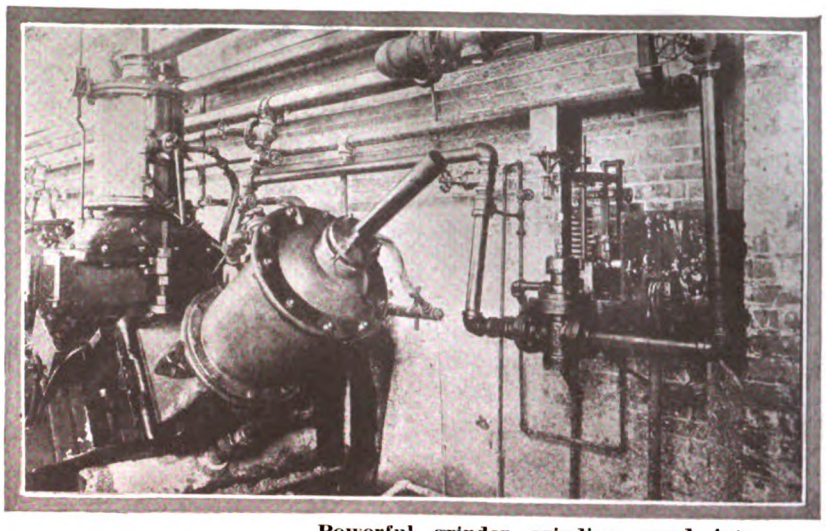
The paper industry has been accused at times of devastating the forest. It uses great quantities of timber, but its total consumption is less than four per cent of the total wood cut each year in this country. Instead of being a devastator of forest land, the paper industry as a whole is going farther in the practice of forestry, and in efforts to commercially restock cut over lands than any other industry either north or south of the Canadian boundary.

Because of the forest situation, the paper industry in America is neither a Canadian nor an American industry, but

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Barkers, where the logs are tumbled about to remove the bark

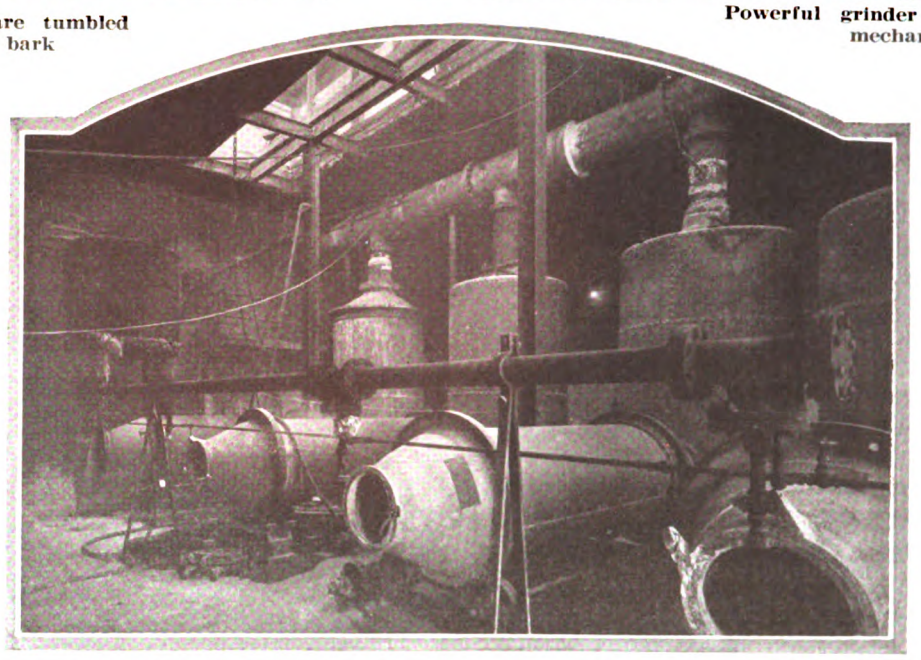


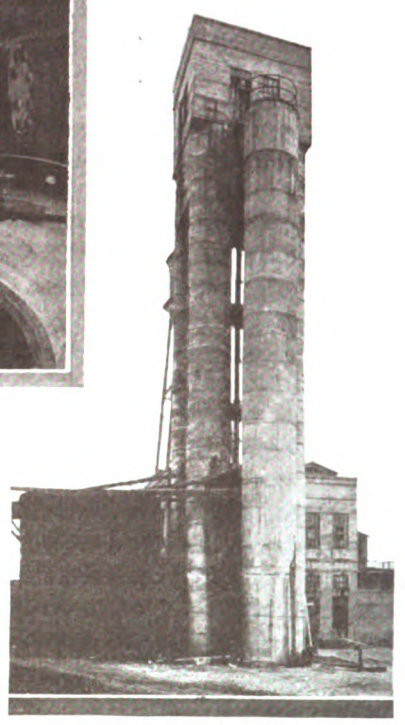
Powerful grinder grinding wood into mechanical pulp

is international in scope. The American manufacturers, however, realizing that Canada, though a neighbor, and a partner in the battles of the World War is still a foreign country, have taken steps to protect their supply of raw material by restocking their cut over lands, through commercial reforestation, and proper forestry treatment of timber stands which still exist.

This discussion of the forestry problem from the standpoint of the paper industry is to avert an apparent discrepancy between the position of the paper industry as a proponent of better forestry, and the great quantities of wood which are seen going through its mills by any visitor to a paper making plant.

The problem of the paper mill today, with reference to its forestry situation is far different from that of the lumber or other wood using industries.

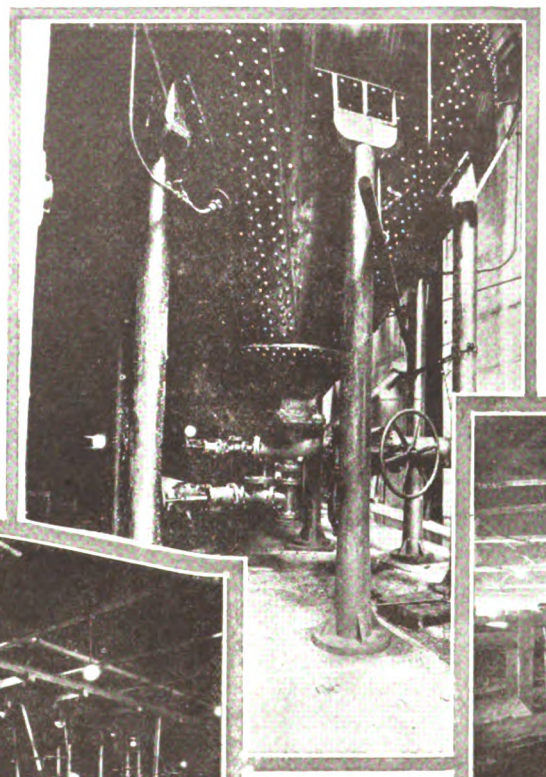


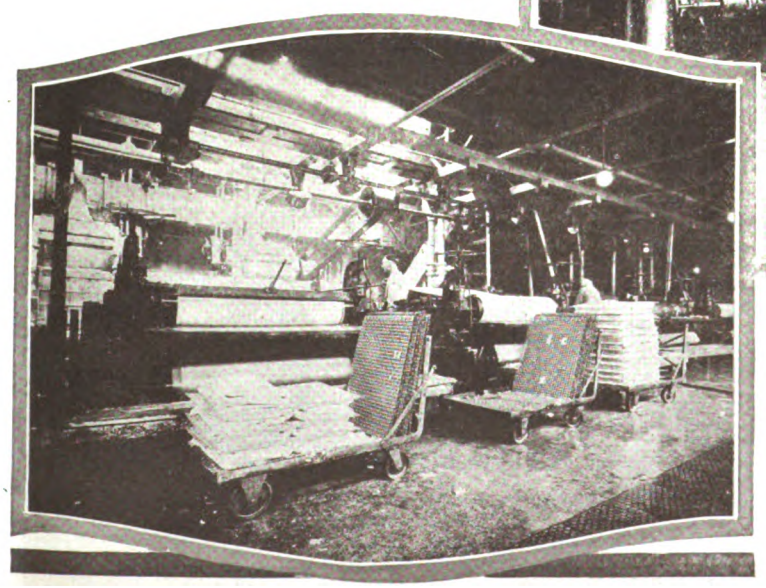


Sulphur burners and combustion chambers for the manufacture of Sulphur Dioxide. (Courtesy of Abitibi Power & Paper Co., Limited)

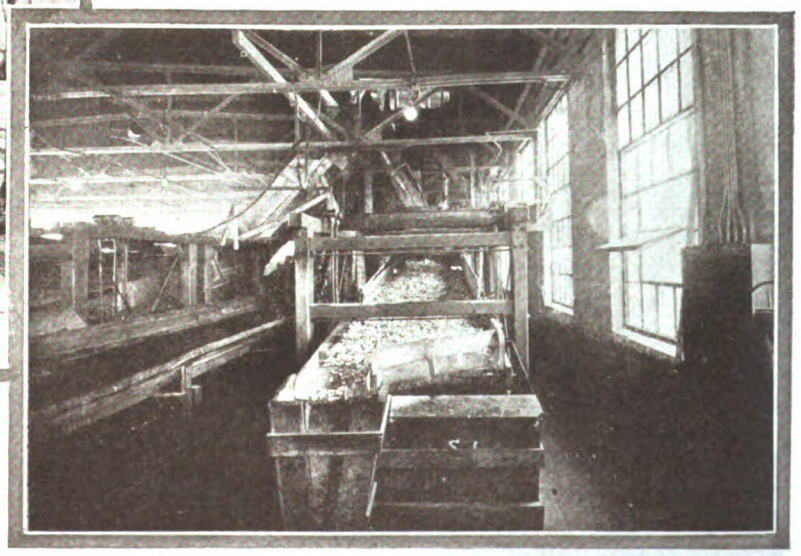
At the left—bottom of a sulphite pulp digester with a capacity of about 14 tons

Sulphite tower, where the acid is made with which to digest the pulp, converting wood into cellulose



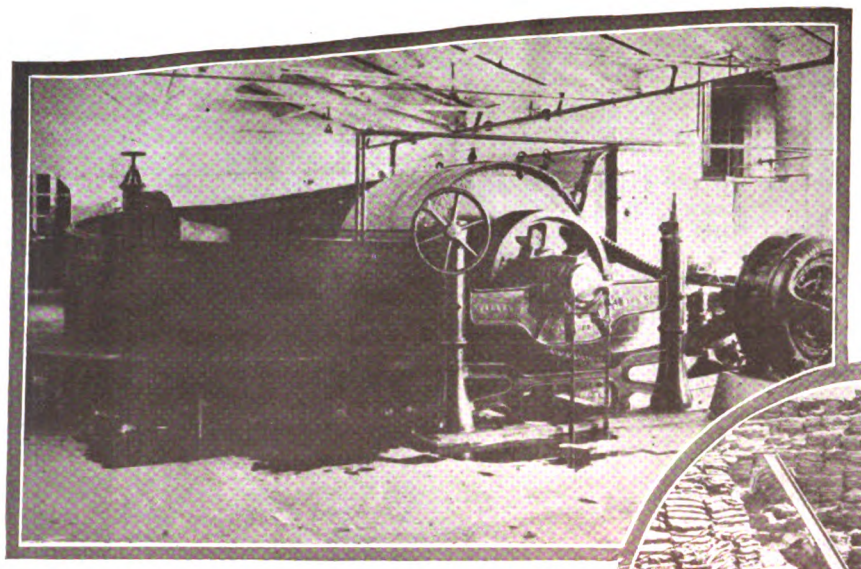


Pulp lapped as it comes from machine



Wood chips on conveyor ready to go to digester

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Beater, where pulp is prepared for the paper machine



Fourdrinier or wet end of No. 1 Walmesley Paper Machine, 202" wide, showing screens (sometimes called strainers and knockers) and wires. (Courtesy of Abitibi Power & Paper Co., Ltd.)



Lapped pulp in huge storage piles

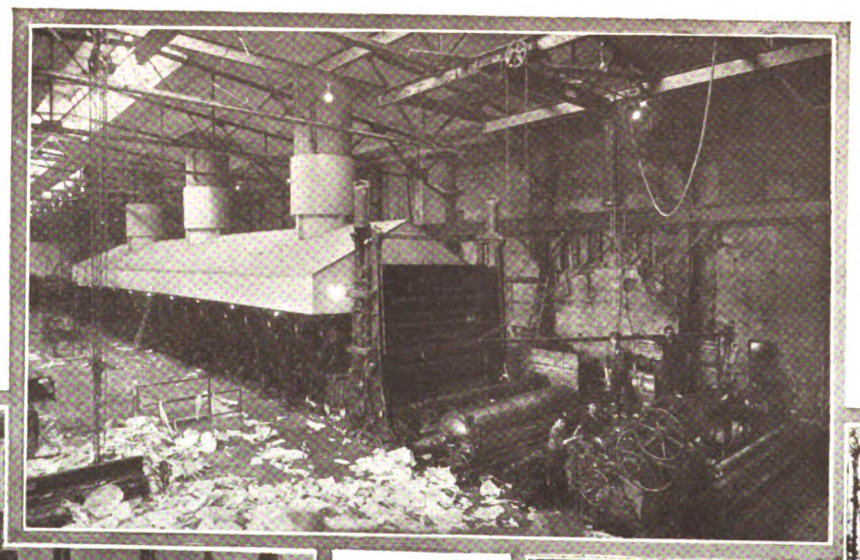
A saw mill of a cheap portable type, or even the great plants of the far west, can cut a fortune in timber and then be scrapped without great loss of capital in plant investment. A paper mill, however, is not so situated. It has been figured that it takes approximately $50,000 of capital investment per ton of daily production to construct and operate a paper mill of a modern type.

In the early days, before the raw material situation was fully realized, the paper mill was located chiefly with reference to water power for their operation, transportation and the market, than with reference to the supply of raw material.

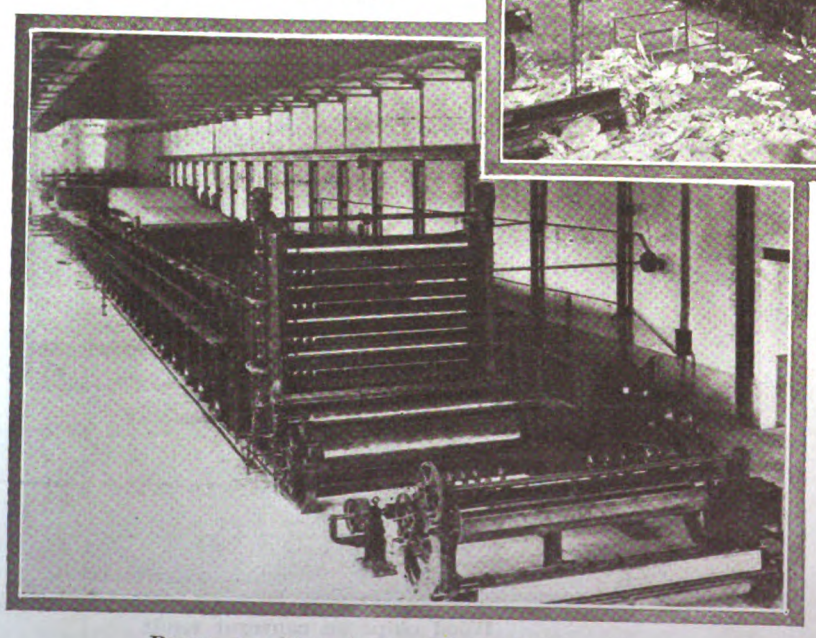
The paper industry in America is largely centralized in such districts as New England, New York and the Lake states, where there were originally apparently inexhaustible forests of the type most suitable for conversion into paper. The great capital investment is still in those states because a paper mill cannot be moved from site to site like a portable saw mill, to follow its source of supply.

As a result of this condition, there has come a great development of the paper industry in Canada, where the new mills are closer to the great northern supply of the best of the pulp

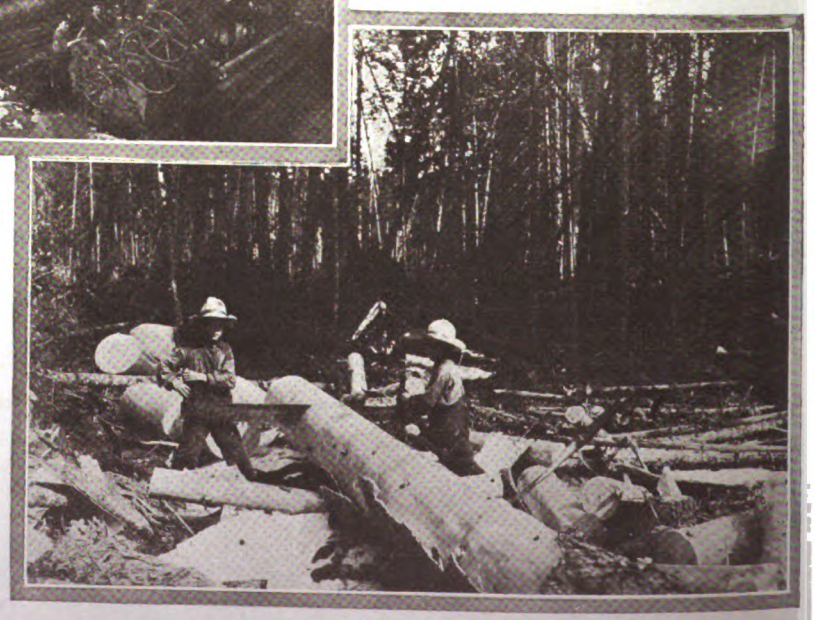
(Continued on Page 57)



Paper machine showing huge steam dryers, heated rolls through which paper goes for removal of excess water



Paper machine from the finishing end, showing its great length



What happens to an old tree—spruce 300 years old being cut up for pulp wood. If converted into book paper for magazine use it would supply the paper for about 1,500 copies of Industry Illustrated

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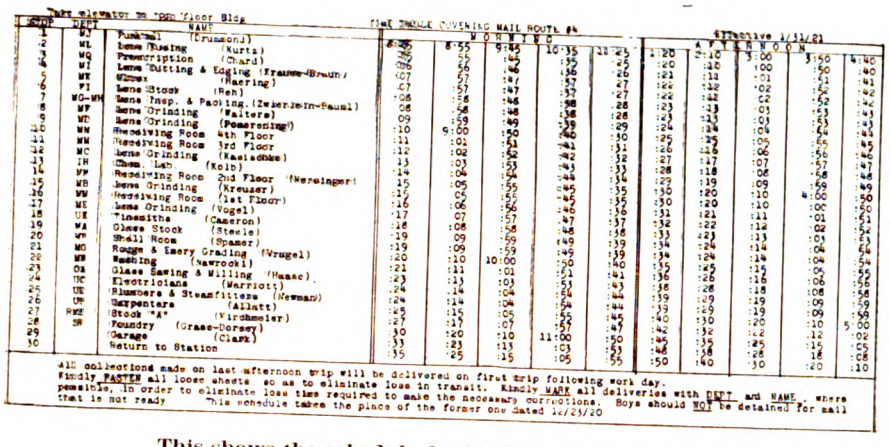
Stimulating the Errand Boy

By A. S. Zimmerman

Industrial Relations Division, Bausch & Lomb Optical Company

MANY large concerns have been and are being confronted with the problem of reducing "Indirect Labor." Every manager has that idea among his foremost thoughts and is devoting much of his time, energy and ability toward the cutting down, where possible, of all such unnecessary help.

One of our problems had to do with errands and factory correspondence. In the carrying out of this particular phase of the business we had, in September, 1920, fifty-three boys scattered throughout the many departments in the plant. It is needless to go into detail to explain the many conditions which face department heads in connection with these boys—knowing where they are and what they are doing. Boys will be boys. These words in themselves cover a multitude of trouble. What would the average manager give to make his boys work manlike, attentive for opportunities to take messages, swift in service, always too busy to chatter and jostle each other? Contrast that picture with the boy who departs on an errand with a slouch, and who gets back at the ultimate moment his ingenuity can achieve. Would you rather have this kind of a boy in your plant? Or would you rather have a boy who jumps at the chance to run an errand and hustles back as soon as the errand is completed? The Bausch & Lomb Optical Company has achieved the latter kind of a boy; not only one, but a group of them who make more money than the average boys and accomplish a great deal more work. They are worth to us every cent they earn.



Take elevator to 10th Floor Bldg			First Trouble Covering Mail Route #4						Effective 4/15/21					
STOP	DEPT	NAME	M O R N I N G						A F T E R N O O N					
1	BO	Punchard (Crumsom)	8:45	8:55	9:45	10:35	11:25		1:20	2:10	3:00	3:50	4:40	
2	MG	Lens Fusing (Kurtz)	:50	:55	:50	:40	:30		:25	:15	:05	:55	:45	
3	MG	Prescription (Chard)	9:05	:10	:05	10:55	:45		:40	:30	:20	4:10	:60	
4	ME	Lens Cutting & Edging (Krause-Braun/	:07	:57	:47	:57	:26		:21	:11	:01	:51	:41	
5	FI	Glass (Haering)	:47	:57	:47	:57	:27		:22	:12	:02	:52	:42	
6	FI	Lens Stock (Reh)	:08	:58	:48	:58	:28		:23	:13	:03	:53	:43	
7	MO-MW	Lens Insp. & Packing (Zwierlein-Faust)	:08	:58	:48	:58	:28		:23	:13	:03	:53	:43	
8	MF	Lens Grinding (Walters)	:09	:59	:49	:59	:29		:24	:14	:04	:54	:44	
9	MS	Lens Grinding (Pomerening)	:10	9:00	:50	11:00	:30		:25	:15	:05	:55	:45	
10	MW	Receiving Room 4th Floor	:11	:01	:51	:01	:31		:26	:16	:06	:56	:46	
11	MW	Receiving Room 3rd Floor	:12	:02	:52	:02	:32		:27	:17	:07	:57	:47	
12	MC	Lens Grinding (Kastenbine)	:13	:03	:53	:03	:33		:28	:18	:08	:58	:48	
13	IH	Chem. Lab (Kelb)	:14	:04	:54	:04	:34		:29	:19	:09	:59	:49	
14	MW	Receiving Room 2nd Floor (Wenzinger)	:15	:05	:55	:05	:35		:30	:20	:10	5:00	:50	
15	MW	Lens Grinding (Kreuzer)	:16	:06	:56	:06	:36		:30	:20	:10	:00	:50	
16	MW	Receiving Room (1st Floor)	:17	:07	:57	:07	:37		:31	:21	:11	:01	:51	
17	ME	Lens Grinding (Vogel)	:18	:08	:58	:08	:38		:32	:22	:12	:02	:52	
18	GR	Tinsmiths (Cameron)	:19	:09	:59	:09	:39		:33	:23	:13	:03	:53	
19	MW	Glass Stock (Steele)	:20	:10	10:00	:10	:40		:34	:24	:14	:04	:54	
20	MS	Small Room (Spaner)	:21	:11	:01	:11	:41		:35	:25	:15	:05	:55	
21	MS	Rouge & Emery Grading (Vrugel)	:22	:12	:02	:12	:42		:36	:26	:16	:06	:56	
22	MB	Washing (Nawrocki)	:23	:13	:03	:13	:43		:37	:27	:17	:07	:57	
23	GR	Glass Sawing & Milling (Haase)	:24	:14	:04	:14	:44		:38	:28	:18	:08	:58	
24	GR	Electricians (Warriott)	:25	:15	:05	:15	:45		:39	:29	:19	:09	:59	
25	UE	Plumbers & Steamfitters (Newman)	:26	:16	:06	:16	:46		:40	:30	:20	:10	5:00	
26	UE	Carpenters (Allatt)	:27	:17	:07	:17	:47		:42	:32	:22	:12	:02	
27	MW	Stock "A" (Virdhmeier)	:28	:18	:08	:18	:48		:43	:33	:23	:13	:03	
28	MW	Foundry (Grass-Dorsey)	:29	:19	:09	:19	:49		:44	:34	:24	:14	:04	
29		Garage (Clark)	:30	:20	:10	11:00	:50		:45	:35	:25	:15	:05	
30		Return to Station	:33	:23	:13	:03	:53		:48	:38	:28	:18	:08	
			:35	:25	:15	:05	:55		:50	:40	:30	:20	:10	

All collections made on last afternoon trip will be delivered on first trip following work day.
Kindly PASTE all loose sheets so as to eliminate loss in transit. Kindly MARK all deliveries with DEPT and NAME, where possible, in order to eliminate loss time required to make the necessary corrections. Boys should NOT be detained for mail that is not ready. This schedule takes the place of the former one dated 12/23/20

This shows the schedule for Mail Route No. 4, which has 30 stops. These routes give fifty-minute service, take about thirty-three minutes to cover, and allow about sixteen minutes for assorting, rest, and making ready.

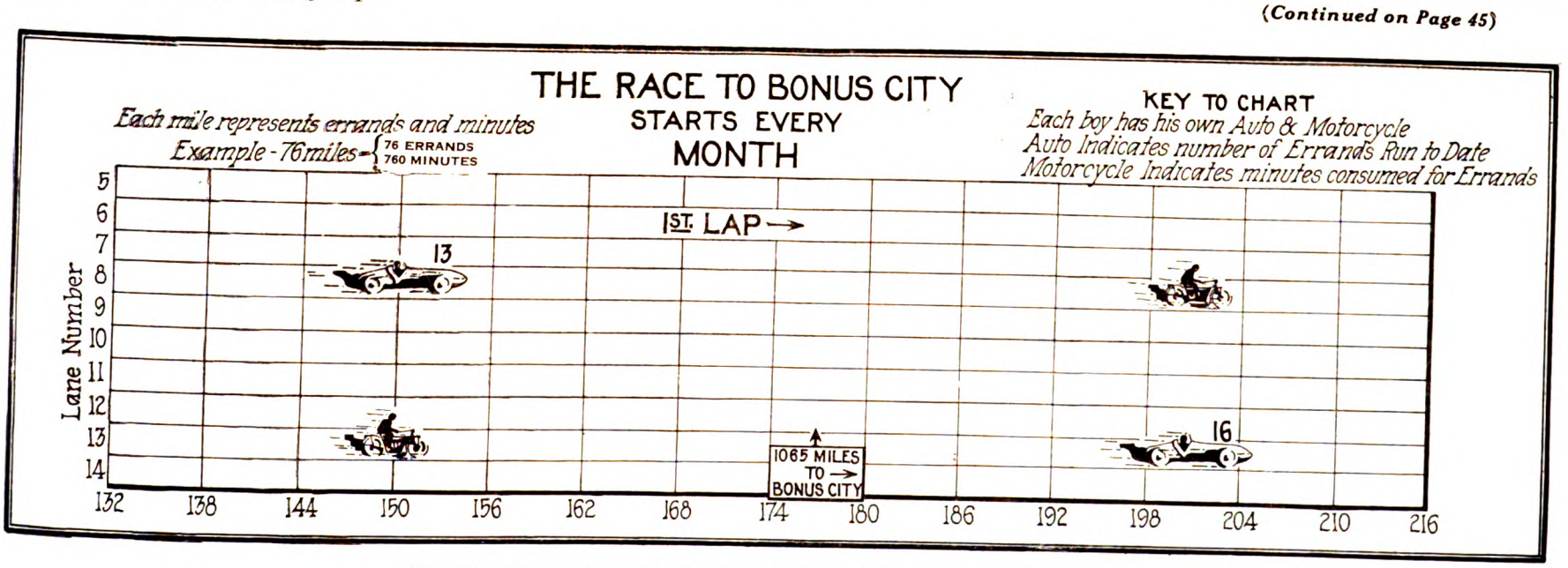


Practically all the boys connected with the errand and mail service are members of the Bausch & Lomb Boy Scout Troop No. 73. The company pays their expenses for one week's camping each year.

A good bonus, fitted accurately to the requirements of the service is the secret of the messenger's efficiency. The conditions surrounding the work of the boys were studied as thoroughly as other important matters in the organization. We were unable to place any time limit on errands, because of the location of departments which are scattered in different buildings and on different floors with the result that the payment of bonus is based on the number of errands accomplished in the shortest time.

The plant, containing over 18 buildings, was geographically divided into four sections and the headquarters for the errand and mail service established in the approximate center. The department is ably supervised by one young man with the assistance of a clerk (male). The supervisor investigates any complaints and ad-

(Continued on Page 45)



Boy No. 16's motorcycle and automobile are respectively at the 150-mile and 200-mile mark, showing that he has accomplished 200 trips in 1,500 minutes. Number 13, on the other hand, is a slow boy, averaging more than 10 minutes per trip. (See text for detailed explanation.)

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America's Industrial Cornerstone

Our Patent Office Must Expand With Our Industries

By N. S. Amstutz

THE one outstanding stimulus of the industries of the country is the Patent System, that, notwithstanding some abuses to which it has been subjected, is in fact the corner stone of the country's industrial development.

The system has fostered development in agriculture, manufacture, electricity, chemistry and the related arts to an extent that cannot be measured. Without its protective features industrial development would have gone through all the ills that unregulated competition could produce and the present state would be chaotic to the last degree by reason of unchecked piracy.

The Patent Office, a branch of the Interior department, is an exception among governmental departments because during its existence its receipts have been greater than its disbursements, until now more than eight million unexpended dollars have accumulated—a contribution from the inventors who have filed applications for patents. The strangest of strange situations now exists, though this self-sustaining department is earning and has earned a comfortable reserve each year to be placed in Uncle Sam's purse. Congress does not even dole out enough funds to make a respectable showing. Comparing its starvation method with ordinary business management, it is as though managerial and administrative prerogatives were entrusted only to those who were paid the smallest sums. The very opposite plan is followed in business establishments because it is the only way in which extraordinary ability can be *secured* and *retained* It is inconceivable that this strangulation should have been permitted to come into existence. The recently passed Lampert bill is but a beginning—an apology for gross neglect—desirable as far as it goes, but entirely inadequate.

Why should membership on the Committee of Patents of the two houses be usually allotted to persons situated largely in non-industrial sections? Why should a floor leader be able to stifle the very existence of legitimately developed industry by inaction, indifference, or under the plea of party expediency? What has the general classification of governmental employees to do with the myriad of wrongs the patena system and its staff have been subjected to in the past?



Noah S. Amstutz has had a remarkable career as a scientist, investigator, inventor and patent expert. An artist as well, his investigations and discoveries have primarily been applied to methods of illustrative reproduction. His childhood days, spent on an Ohio farm, were enlivened by the making of telescopes, camera obscuras and microscopes from discarded spectacle lenses, followed by early experiences in lithography at a nearby plant. In 1885, he devised a method of wax engraving, and also devised the first system of photographing by telegraph, thus originating the process of phototelegraphy. The next five years were spent largely in research in England and on the Continent. In 1901-3, he organized the Amstutz-Osborn Company, subsequently merged into the American Multigraph Company. He is a recognized authority on engraving technique, and the originator of automatic halftone engraving. Mr. Amstutz is a member of the American Institute of Electrical Engineers and the International Geographical Society; past president of the State Microscopic Society of Illinois; member of the Royal Photographical Society; fellow of the Royal Society of Arts (London); honorary member of the International Association of Manufacturing Photo-Engravers; member of the Societe Academique d'Histoire Internationale (Paris). He is keenly interested in the development and expansion of the American Patent Office as a vital necessity for scientific and industrial progress.

There is no other department in which the absolute necessity of experts is so obvious as in the Patent Office. Yet, from July, 1919, to July 1, 1921, the system which has been in vogue—and which is but partially corrected by the Lampert Bill—resulted in 163 resignations from a total staff of 437 Examiners. One of the most important divisions in the office has had its staff of assistant examiners completely changed in a year.

The strangulation is proving a most expensive and irritating procedure for the very class which has already contributed several million dollars. Through inadequate official actions, premature and immature patents issue which result in needless litigation because of the inexperience of men who must fill the vacancies caused by the resignations of experienced experts. This is in effect nullifying the intent of the statutes which provide that for seventeen years an inventor shall have the exclusive emoluments from his invention, in consideration of which he shall make such a disclosure that at the expiration of this time anyone skilled in the art shall be free to make and sell the same. To grant this right the government exacts $35.00 in fees, but its part is to render adequate service, which cannot be done by inexperienced examiners, hence in the opinion of Ex-Vice-President Marshall expressed to the author at a meeting in the vicepresident's office in the Capitol, the government by becoming a party to inefficient work produces needless litigation and stigmatizes the whole system of patent protection besides securing money from industry without a proper *quid pro quo.*

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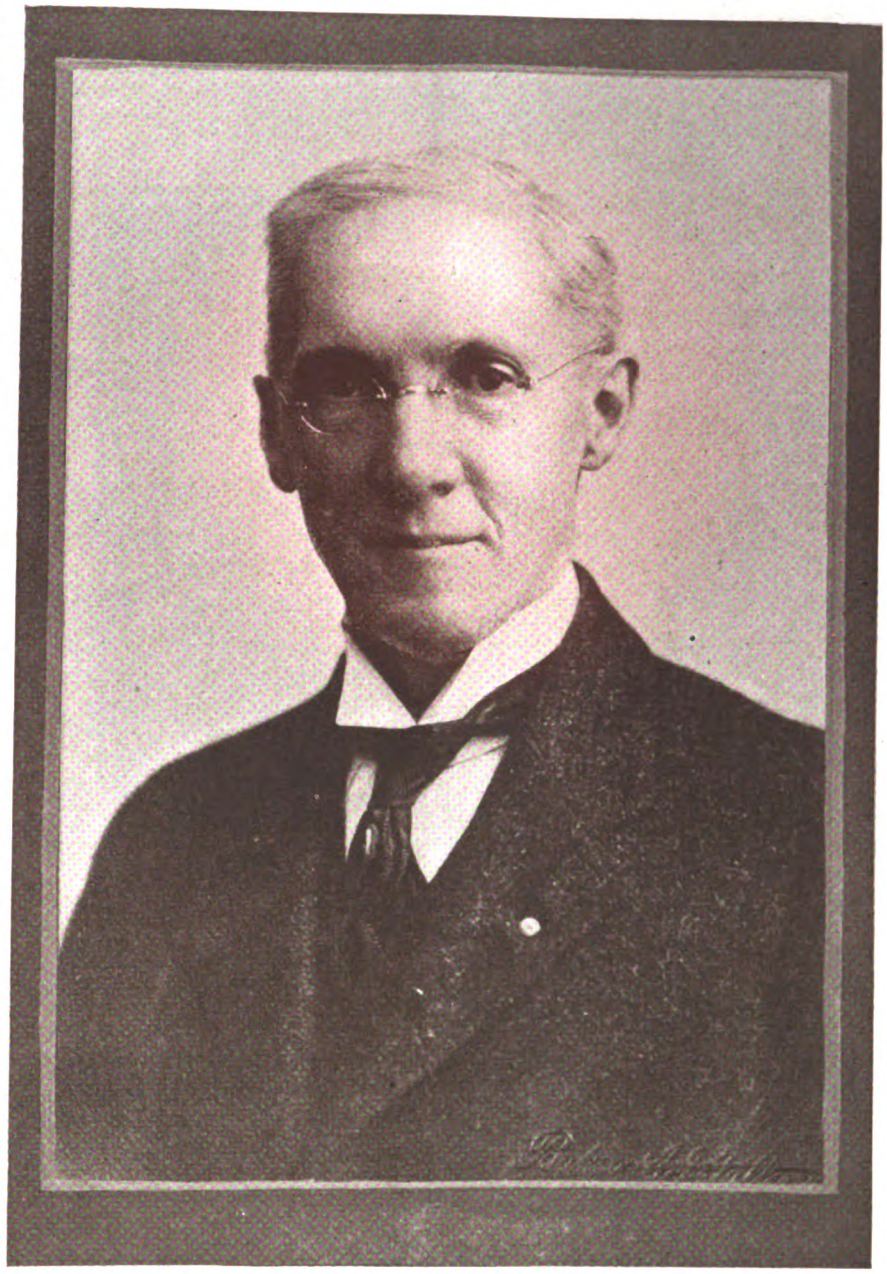
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The Present Trend in Engineering Education

By Wm. T. Magruder, M. E., E. D.

AS civilization and education which creates it get more complex, so the trends therein get more complicated. The all-around engineer, like the all-round mechanic is an ideal of the past. Today, the engineer, like the architect, knows enough to know that he cannot know it all, and therefore employs men who are experts in each of the branches of the profession that he may have occasion to use. In the olden days, the man who invented or planned the machine, frequently had to build it, and then go out and sell it. Nowadays, we have specialists in research, in conceiving and planning, in manufacturing, constructing, execution, and production, in contracting and business, and in sales-engineering. Besides these we have the teaching engineers by whom the professional race of engineers is reproduced, *and they are not all engaged in the colleges.*

Today, it is recognized that the engineering college, or technical school, owes a duty to the student, to the profession, and to the public. To become a successful engineer, the student should have a strong, well-developed body, a highly trained mind, and a character well-developed ethically. For these purposes, the colleges are spending large sums not only in intercollegiate athletics but in intramural games of all kinds, and have not one base-ball or basket-ball squad, but dozens of them, all engaged in competitive recreation. It is found that rational athletics pays better than disciplinary measures. A dean of men is the guide and mentor to the present day student that the president was to the college student of forty years ago. He is a specialist in directing college men. The faculty adviser should be capable of analyzing the student's aptitude and personality and of guiding him aright into the line of work for which he is apparently best fitted. The college should give the student a vision of the world and of life, and of his place in each.



Prof. William T. Magruder combines practical industrial experience with an intimate knowledge of higher educational methods. He graduated from Stevens Institute of Technology in 1881, with the degree of M. E., and was a graduate student in mathematics and chemistry in Johns Hopkins University in 1886 and 1887. He has been a draftsman and designer, chief chemist of the B. & O., chief of machinery of the Tennessee Centennial Exposition of 1896, and is a consulting engineer of gas engineering practice in addition to being professor of mechanical engineering of the Ohio State University since 1896. Professor Magruder is a member of the American Society of Mechanical Engineers; was president of the Engineers' Club of Columbus, 1904-5; president of the Ohio Society of Mechanical Engineers 1905-7; a member of the Society for the Promotion of Engineering Education (of which he has been successively councillor, secretary and president). His long and intimate experience with technical educational methods gives authority and interest to his accompanying statement.

The engineering profession has gotten beyond the "chalk age" and the time when drawing *boards* never carried paper. There are fewer men entering the profession today by the shop door, the rod and chain, the pick and shovel, or the wash-bottle route. Those methods made some extremely fine men but did not make them fast enough to supply our present demands. The business of the engineering college is to prepare men either for leadership in research, design, production, business, or sales-engineering, or else for the rank and file of the engineering positions. It must prepare men to take and hold their places in the post-graduate courses given in the meetings of the National Engineering Societies, three-quarters of whose leaders now are college graduates, instead of one-quarter, as was the case forty years ago.

In training men to serve the public, the colleges earn their support from the Nation, State and their benefactors. They must train men to be thinkers and not doers only, to be professional men and not trade-operators, to be leaders and not simply followers, to be honest and above reproach whether in athletics, examinations, or in business. Unfortunately, some students stop at the lower levels in scholarship and integrity and never get the larger vision.

Because more students have practiced engineering trades than ever before, and have earned part of their income, there are more irregular students than formerly when self-support was uncommon. In some colleges most of the students have worked for their living at some trade or business. Because manual training is being taught in so many of our high schools, there is less need for shop-work as it used to be taught at many of the older colleges. In fact, it has been found that manual dexterity can be learned in many arts besides the older mechanic arts. The problem therefore

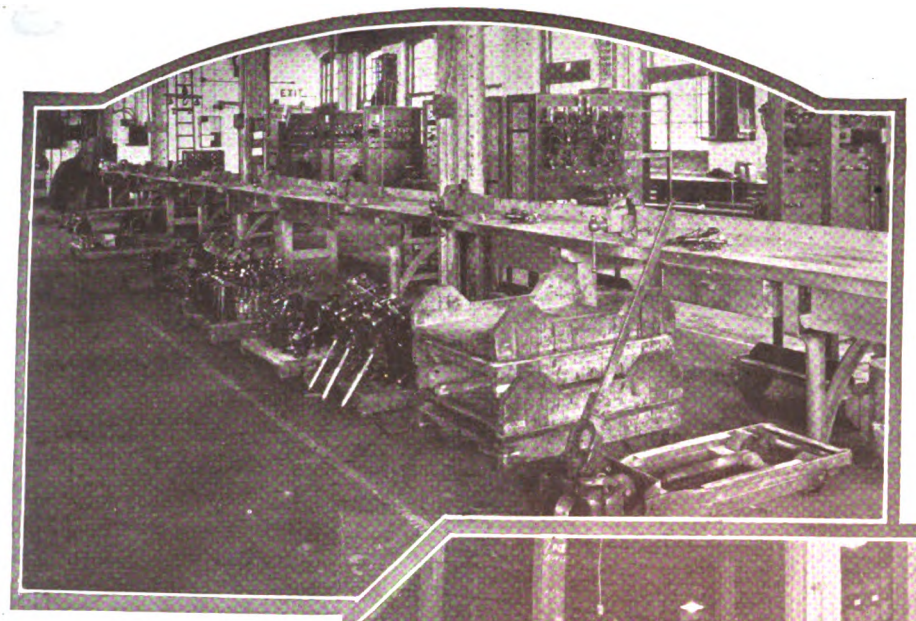
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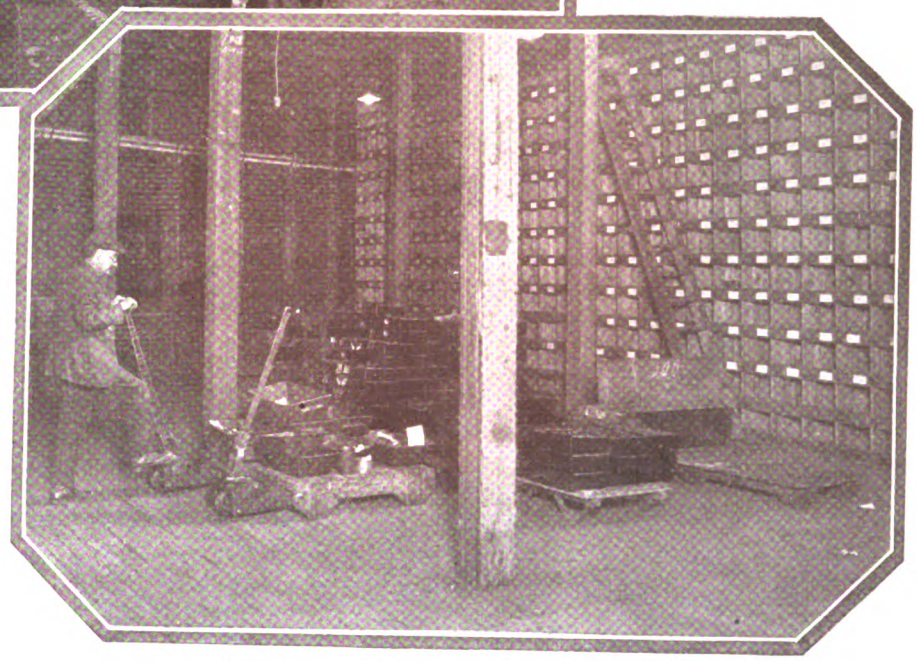
The Self-Loading Truck

By Ralph J.

Supervisor of Transportation, Otis



Above is shown the general arrangement of controller stock on assembly floor



Skids loaded with stock ready for delivery to manufacturing departments

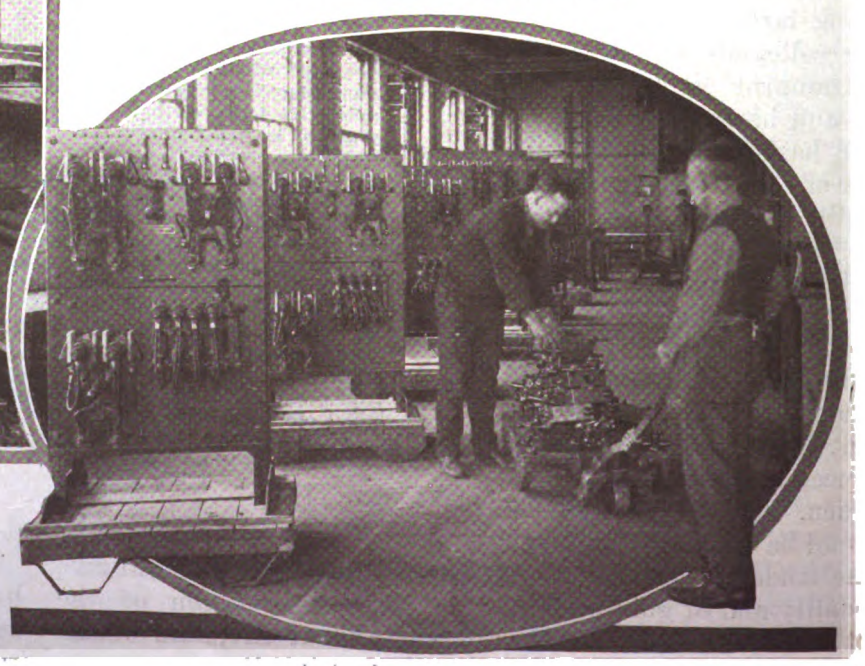
IN an industry in which manufacturing processes are repetitive, material transportation may be made synchronous to the extent that a commodity will move as a routine step in the process. The predetermined output of a product of average symmetry, unvarying machine operations, and an unchanging destination, make self-evident the time and number of delivery periods, average load weights, daily consumption of raw stock, and furnish a ready means of compiling accurate cost records. In machine building industries where a fluctuating volume of production at various points is encountered, with a product not fixed in its characteristics, and a class of work for service orders that must be given special attention and preference, material must be so arranged as to allow for the transportation of a single unit or bulk lot with the least possible delay while still maintaining a high degree of trucking efficiency.

The plan here described has been developed to accommodate *both* conditions and provides for an inter-department, inter-building and highway transportation system. Gasoline trucks transport all material to and from the factory proper. Self-loading, electric-



Arrangement of stock in small parts assembly department

In the oval, below—Delivery of controller parts to the various operations



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in the Elevator Industry

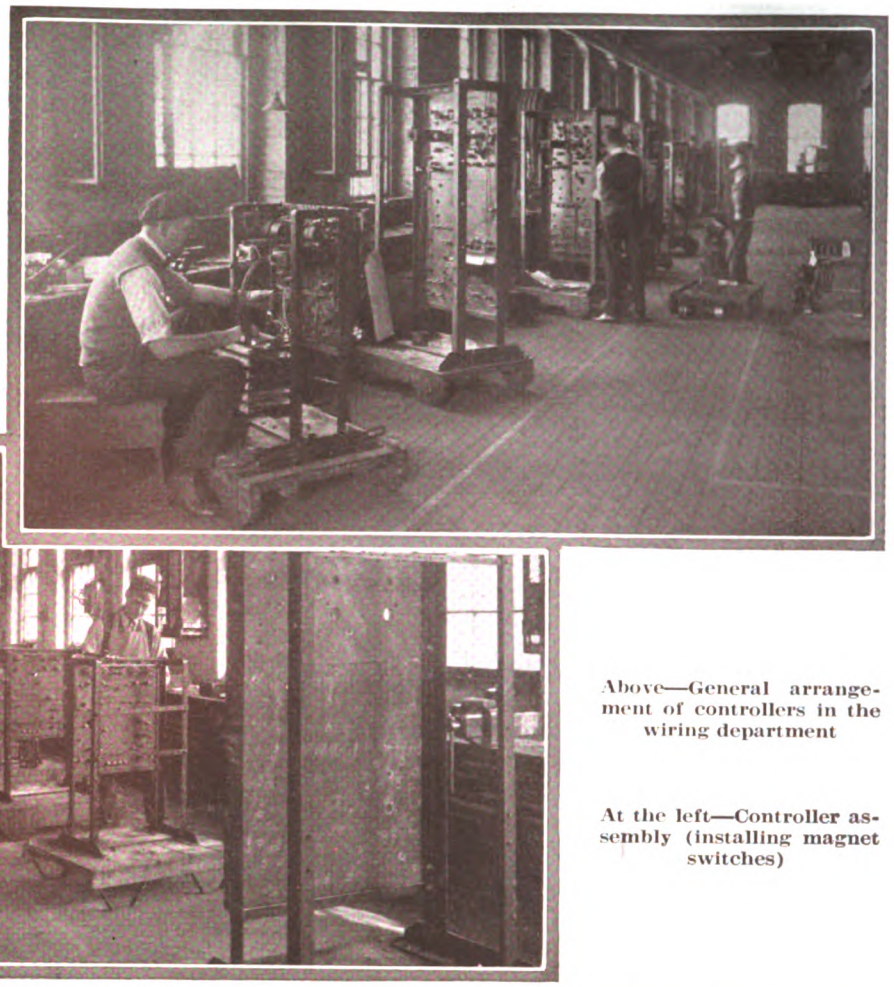
PEARSON

Elevator Company, Yonkers, N. Y.

ally propelled industrial trucks are used to supply building store rooms and assembly points with material from centrally located bulk store houses. Long outside hauls through yards and between buildings also necessitate the use of electric self-loading trucks. This class of equipment is controlled from the office of a dispatcher and both gas and electric trucks follow a time and route schedule.

Inter-department, or short distance haulage, however, is divided among the various departments, each floor or department being supplied with a hand-operated self-loading truck and the necessary number of platforms (or skids). Although the department foreman's time is conserved for production activities, he supervises the movement of all material after it has been delivered to his floor.

The segregation of like tools diverts similar materials to the one department and permits the skids being designed to accommodate capacity loads of unsymmetrical goods that would be found inconvenient to handle on the standard flat platform. Admirably adaptable to a host of conditions, the lift truck skid is provided with a simple notched block platform, for steel bar stock;



Above—General arrangement of controllers in the wiring department

At the left—Controller assembly (installing magnet switches)

At the right—Controller assembly (inspection of switches)



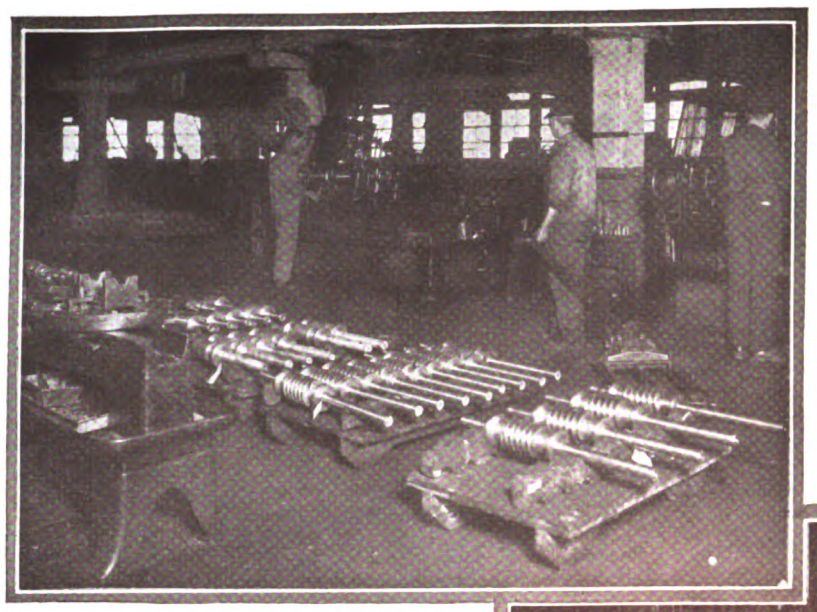
Below—Sheave shaft grinding operation





Section of final testing department

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Finished worm shafts ready for delivery



Arrangement of stock in drill press department



Arrangement of stock in turret lathe department

equipped with racks, for long stock lengths of brass and copper tubing; is spike-studded for sheaves, small pulleys, notched laminations, etc.; and, with built up sides, may be used to store large quantities of small material such as bolts, nuts, electric contacts, etc.

The foreman, in constant touch with the ever changing condition of material on his floor, supervises the orderly arrangement of loaded skids near machine tools and the disbursement of finished parts to the next operation or store room. It has been found that by this method the orderly appearance of departments, clear runways, and provision for the necessary safe and comfortable working conditions near machines, become matters of habit and departmental routine, requiring only general supervision.

Progressive manufacture, or a process involving several operations in the same or a group of adjacent departments, is carried on with a minimum of material-handling as the self-loading truck skids afford a flexible medium for the storage of rough stock near machine operators as well as an ever-ready means of moving semi-finished parts to the succeeding operation, yet require only a small percentage of the time of the laborer or floor man.

Elevator controlling apparatus, for example, (electric switchboard controllers), requiring from 30 to 40 hours of exacting workmanship to complete, move through three departments from assembly to the shipping room on the same skids. During this period, in the first department, the controller is completely assembled and ready for the wiring department. Here all electric circuits are connected and inspected. The last or testing department checks all mechanical and electrical work, subjecting each circuit and operation to electrical tests and compiling an exact record of all data thus obtained. After a final inspection, in which the apparatus is completely connected so as to function as in actual use, the finished product is for the first time lifted from the skid to the waiting gas truck. Due to the exceptional care exercised in manufacture, it is very desirous that unnecessary handling be eliminated and this has been carried out to the extent that the actual handling of the controller or switchboard is reduced to one "pick up" by crane to truck platform.

(*Continued on Page 52*)



Sheet steel laminated stock on spike skids



Electric industrial truck about to lift loaded platform

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Vacation Camp of the New York Telephone Girl

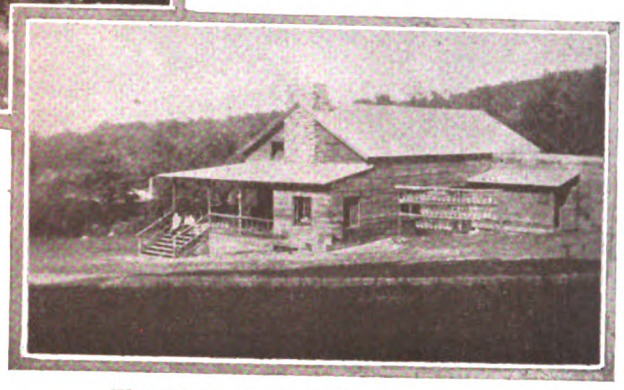
By Anna L. White



At the left is a general view of Camp Sherwood, maintained by The New York Telephone Company.

Below—Setting-up exercises, under direction of the camp's physical instructor.





The Main Hall of the camp, where the girls congregate for social activities.



One of the motor buses which supply transit between camp and railroad.

"Come to Sherwood!
Come to Sherwood!
Where we have fun."

AROUND Dead Men's Curve into the main road trundled a motor bus overflowing with girls who were dressed in bloomers and middies, and were singing lustily. The song rang out with added gusto as the heavy bus ran into a rut and bumped out again,

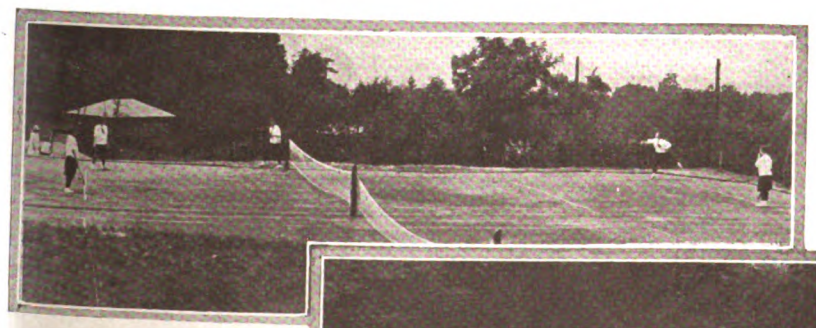
"Buses bump us almost dump us,
Still we have fun."

That was my first impression—the first sight and sound—of Camp Sherwood, the vacation camp of the New York Telephone Company. As we rounded the curve and drove up the road, there the camp lay before us, extending up the hill, first the big colonial house which the company has taken over for a convalescent home for its women employes, then

(Continued on Page 36)



The out-door dining porch lends added zest to the camp cooking.



Well-kept tennis courts furnish a means for healthy recreation.



One of the "shacks" at the camp. Plenty of air, without the discomforts of tent life.



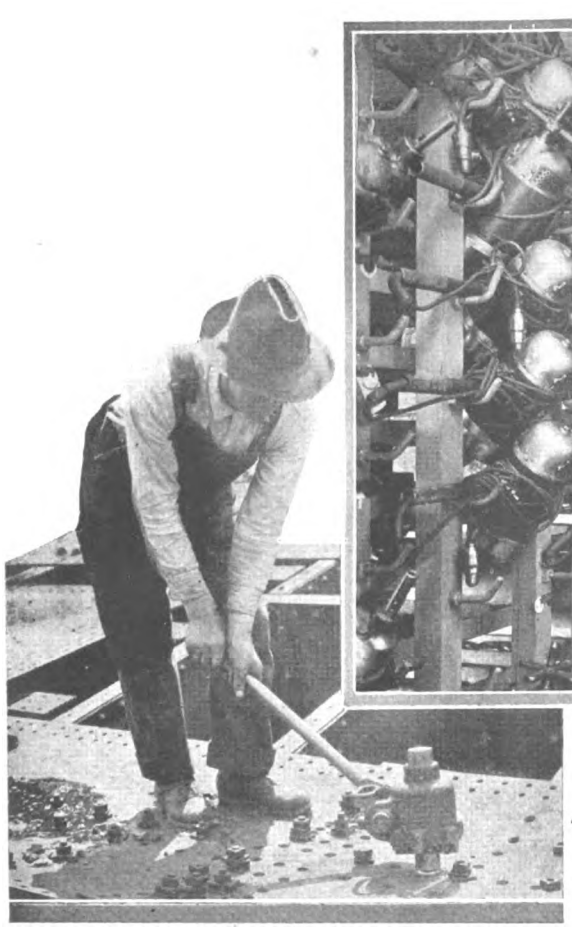
The Swimming Pool, where a competent instructor teaches swimming and diving.

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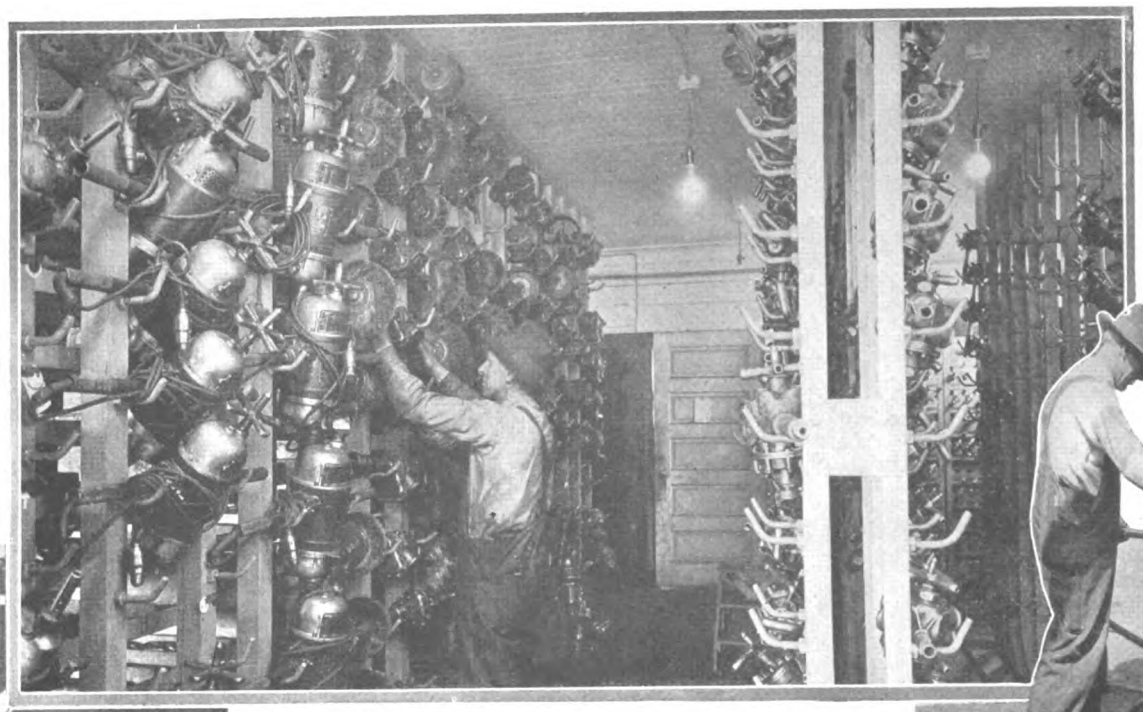
Better Methods in the Tool Room

Labor-Saving Ideas Developed by an Assistant Shop Superintendent

BY O. H. KNEEN



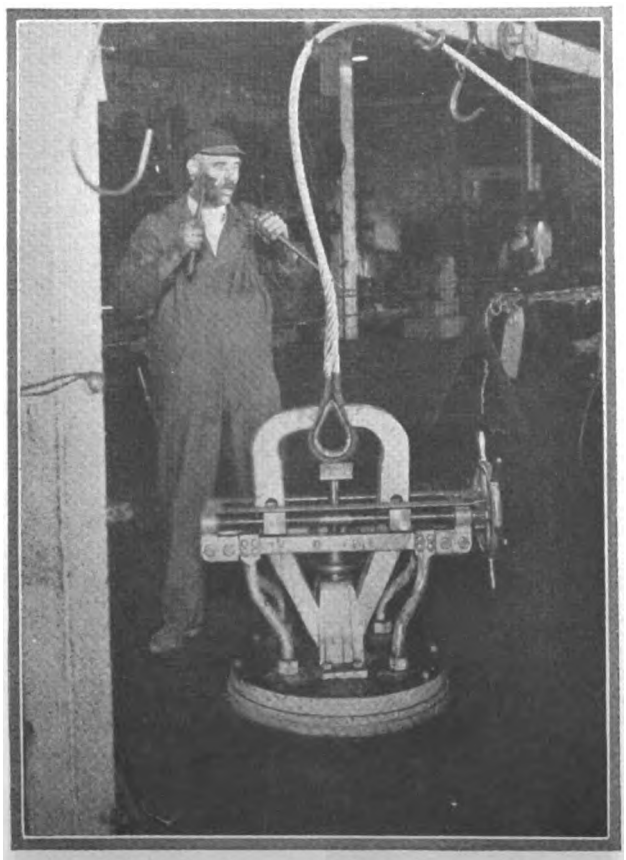
20-ton Bolting-up Jack: One man exerting a pulling force of 40,000 lbs. on a rider plate over vertical keel, U. S. S. "Holland," under construction at Puget Sound Navy Yard. Total weight of jack 55 lbs.



Pneumatic drill section, Central Hull Toolroom; showing racks extending from floor to ceiling (9 feet 4 inches high), for drill machines, wire brush machines, electric drills, etc. Foor space occupied by drill racks, 85 sq. ft. for 400 tools, or almost 5 tools per square foot of floor space.



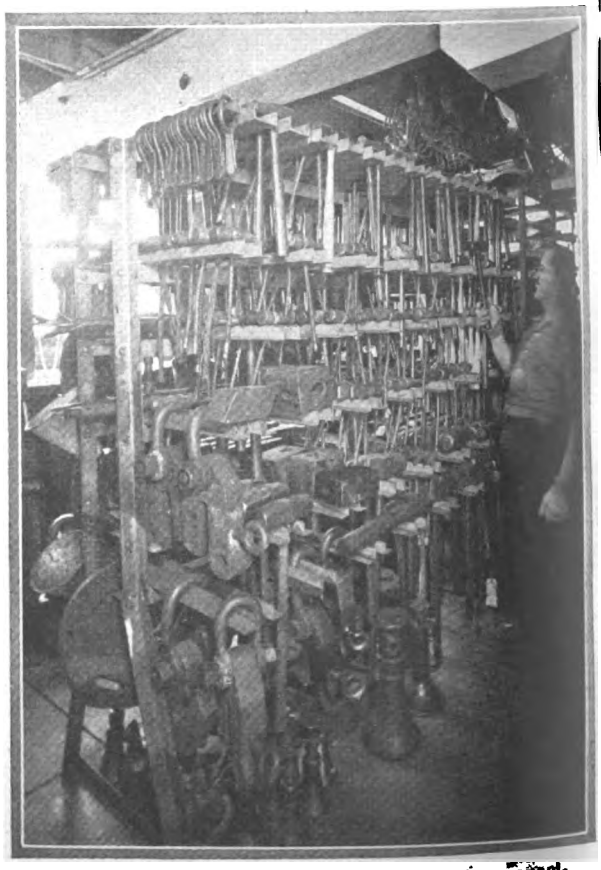
Nut tightener, designed in Plant Department, planetary gear type, 60 to 1 reduction, driven by rebuilt No. 2 pneumatic drill, reversed rotation. Total weight 63 lbs. Capacity all sizes up to 7/8-in. Output on straight away work, 175 per hour. A labor saving device particularly adapted for desk and flat work.



Rigging vise, specially-designed in Plant Department full rotating base, jaws quickly adjustable for all sizes of thimbles and cable. Greatly facilitates splicing and rigging work in the Navy Yard.

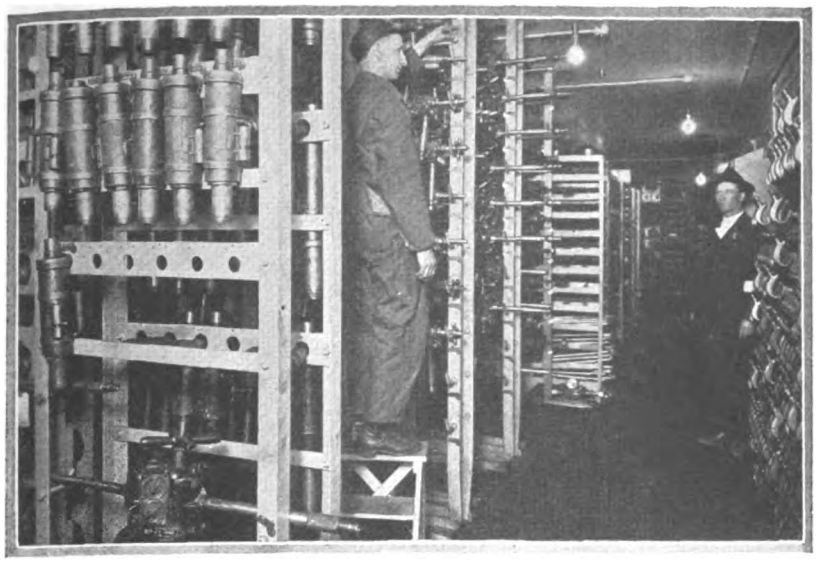
BELOW at the right is shown a tool rack which I designed in 1920, and which provides for the same floor space approximately six times the lineal feet of hanging space of the usual type. This design of rack will take care of almost any type of tool with a head, handle, hook, eye, or other form which can be placed in a slot, hung from the arms, or placed across the arms. In addition, long bars, augers, and similar tools can be placed lengthwise in the center spaces on the arms or on special shelves.

I believe the illustrations on these two pages represent the latest practice in tool room racks and shelving, very careful study being made of the requirements in each case, and particular emphasis being placed on ease of access to tools. Saving of time and handling was considered of prime importance; economy of space was also considered essential. Over $200,000 worth of tools are stored in the tool room shown in these illustrations; these tools are for hull construction and repair only, and do not include machine shop equipment.



Special Hammer Rack, having a hanging capacity of 115 lineal feet, or about six times the capacity of ordinary rack which it replaced, for same floor space. This rack can sustain one ton of tools on each side, independently, on 23 square feet of floor space.

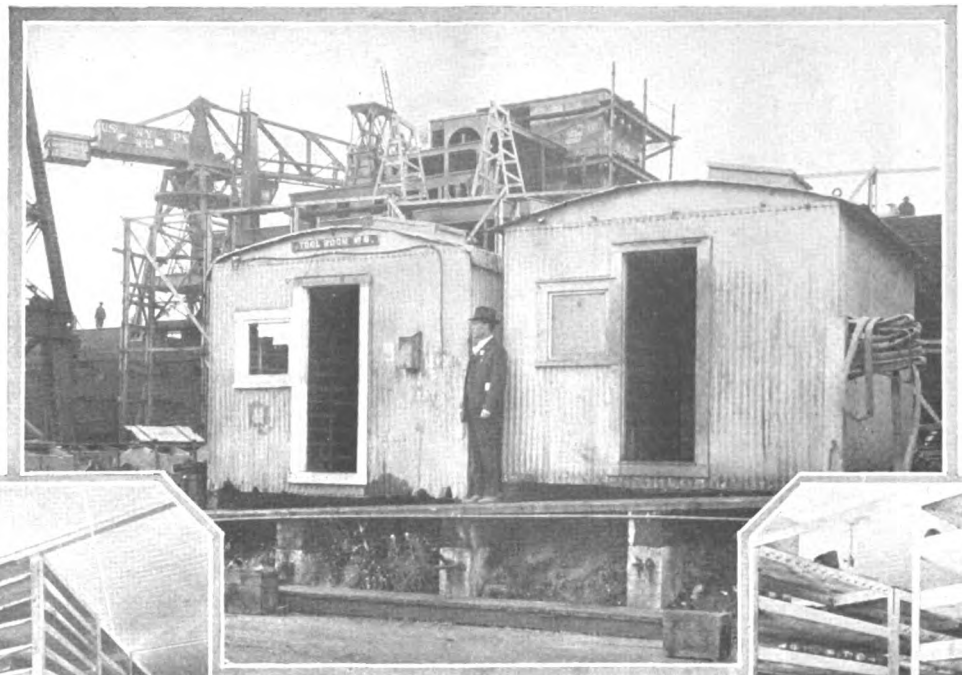
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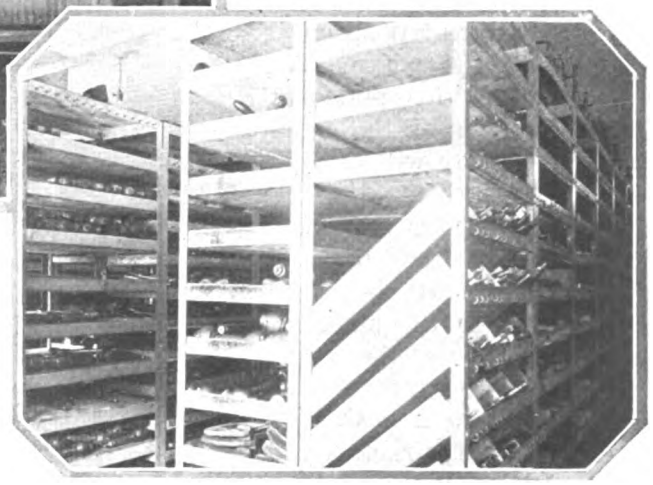
Central Hull Toolroom, rear aisle, showing special racks for combination holders-on and jam riveters, at left; and chipping hammers at right. Particular attention is paid to illuminating all shelves and racks.



Pneumatic Machine Section, looking from issuing window No. 5. These specially designed racks require a minimum both of floor space and of labor to remove tools. Their cost is very low. Floor space occupied by hammer and miscellaneous power tool racks 110 square feet, for 1600 tools, or almost 15 tools per square foot of floor.



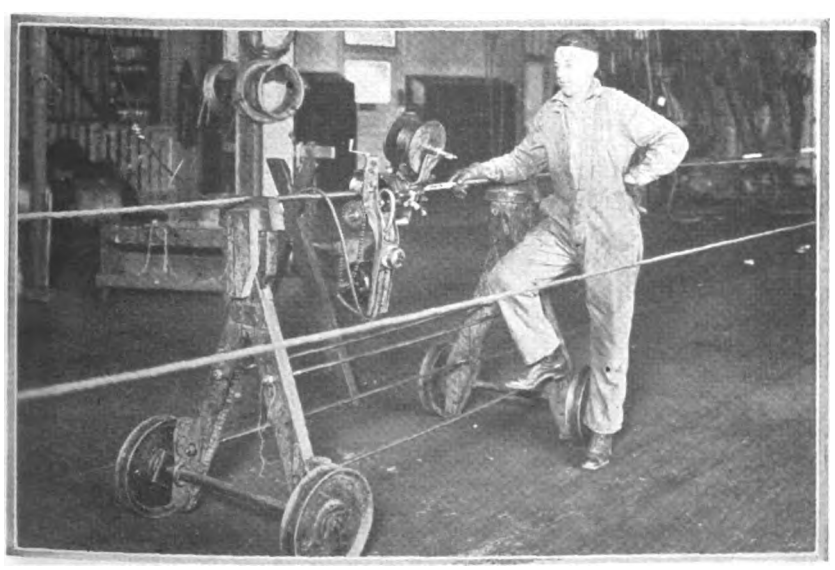




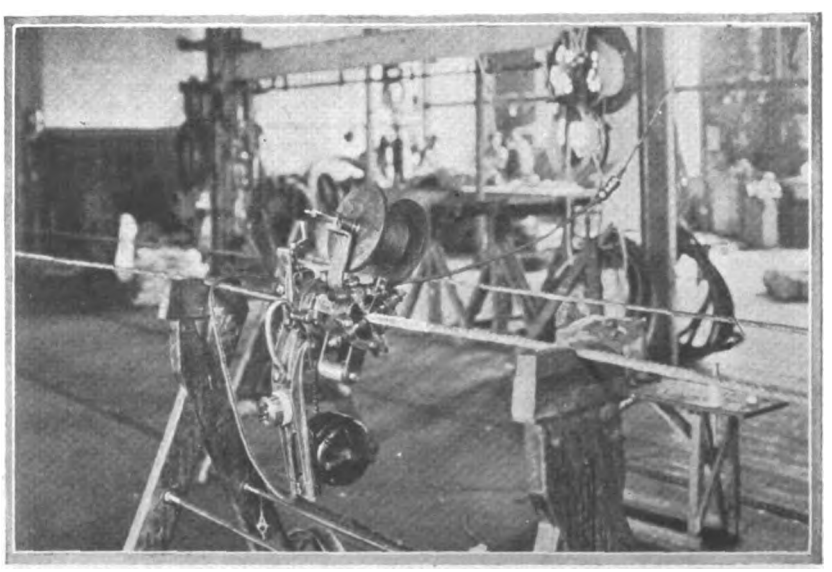
Portable toolrooms, carrying stock of tools for emergency work; can be stocked and moved by crane on an hour's notice, to any part of Yard or on board vessels. Enables workman to exchange dull tools without loss of time. In background, Repair Ship under construction; a 10,000-ton vessel, 484 feet long, to be fully equipped with machine tools for repair work at sea.

Riveters' tools, Central Hull Toolroom, showing light extensions; rivet sets; holding-on bars and miscellaneous tools; brass checks are placed on hooks located on edge of shelf from which tool is withdrawn, except where impracticable.

Drillers' tools, Central Hull Toolroom; ratchets; hammers; clamps; wrenches; reamers; countersinks; extension sockets; etc. Total floor space covered by all tool-racks in main issuing room, 240 square feet; 2678 square feet of shelving.



Serving machine for winding marlin or wire on cable, rope wire or pipe, of ⅜-in. to 1½-in. diameter, designed after working model made by Yard employee.



Another view of serving machine, on ⅞-in. wire cable; two feet of cable has been served. Serves 90 ft. per hour, and weighs 40 lbs. Works 12 times as fast as by hand.

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Using Molding Machines on Heavy Castings

Details of a Successful Installation in a Car-Wheel Foundry

By H. H. Leonard

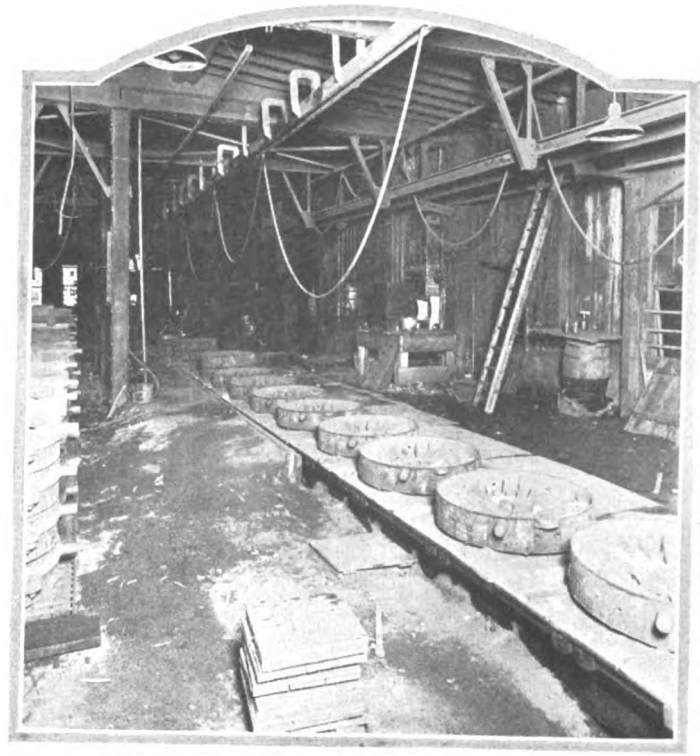
FOUNDRIES manufacturing car wheels have hitherto been unable to make use of molding machines due to the weight of the castings being made and the excessive amount of sand required for making the molds. It is obvious that if it were possible to overcome these objections, great savings could be made in the manufacture of these car wheels.

The installation illustrated in the accompanying views shows the way that this was accomplished at the plant of the Brown Car Wheel Works, Inc., of Buffalo. A platform composed of cars moving on a track of rectangular layout of such proportions that it connects the points where the molding machines are located with the pouring position, is so located that when molds are placed upon this platform as they come from the molding machines, they will be carried automatically to the point where the molten metal is distributed from the Cupola.

The platform then carries the molds to the shaking-out position, where the castings are removed from the mold and placed in a soaking pit; the sand, as it is removed from the flask by means of a jarring machine, falls through a grating to a conveyor beneath the floor which carries it to a revolving screen where foreign particles are removed from it. The sand then passes over a magnetic separator to insure the removal of any particles of iron and from thence it is taken to a storage bin in the top of the foundry. From this bin, it is distributed to the molding machines by gravity through a chute, as is clearly shown in one of the views. The movement of the platform is intermittent; remaining stationary while the mold is being placed upon the car and also during the operation of pouring, thus permitting the operator to work under the most advantageous conditions.

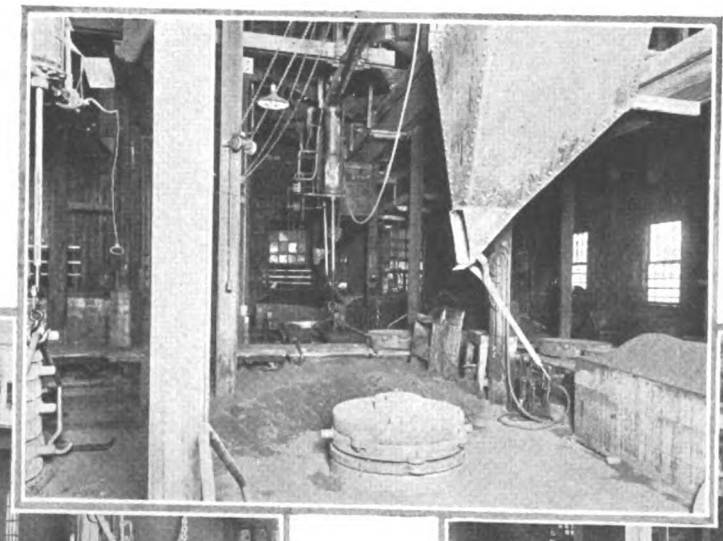
The movement of the platform is thus accomplished by intermittent motion in increments equal to the length of a car body. After removing the sand from the molds, the empty flasks are returned to the molding machines by means of the lines of gravity conveyors shown in one of the views.

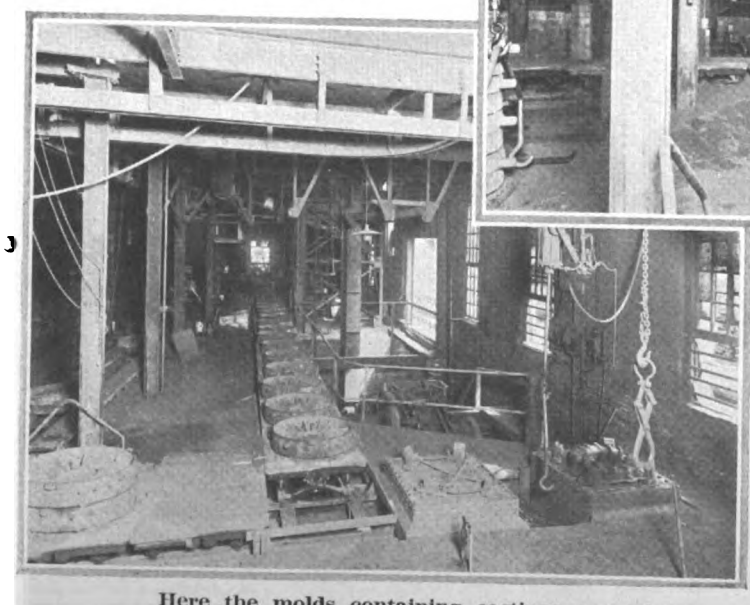
The installation has not only reduced the amount of labor required, but has made it possible to obtain the required production in one-half of the floor space that was formerly needed.



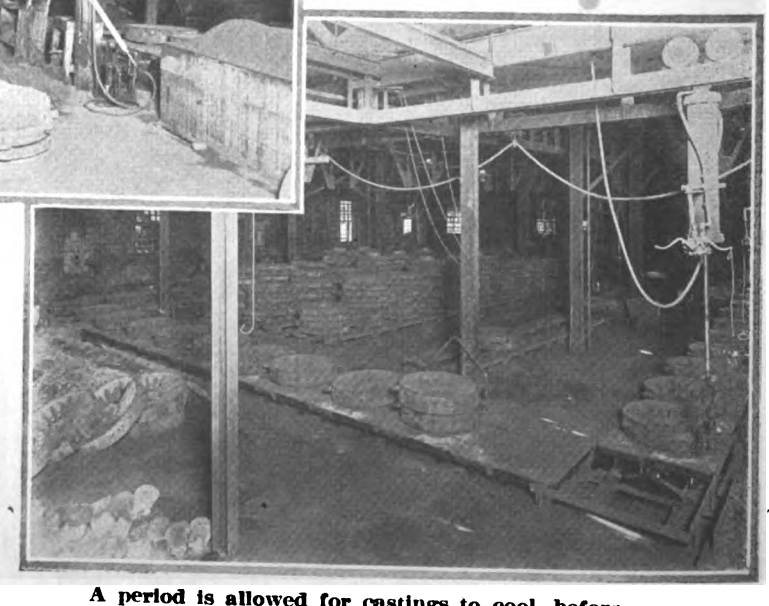
The platform carries molds to the pouring positions shown. The overhead track carries the pouring ladle from cupola, over the molds

Below—Car wheel molds are made on two molding machines and deposited on a moving platform passing between. Sand is delivered to the mold through the sand chute by gravity.





Here the molds containing castings are taken from platform and deposited on shake-out machines; the sand falling through a grating to conveyor, and casting passing on to soaking pits while the empty flasks return to the molding machines.



A period is allowed for castings to cool, before shaking out. The platform is shown carrying molds after they have been poured. Note the empty flasks on roller gravity conveyors, ready for use on the molding machines.

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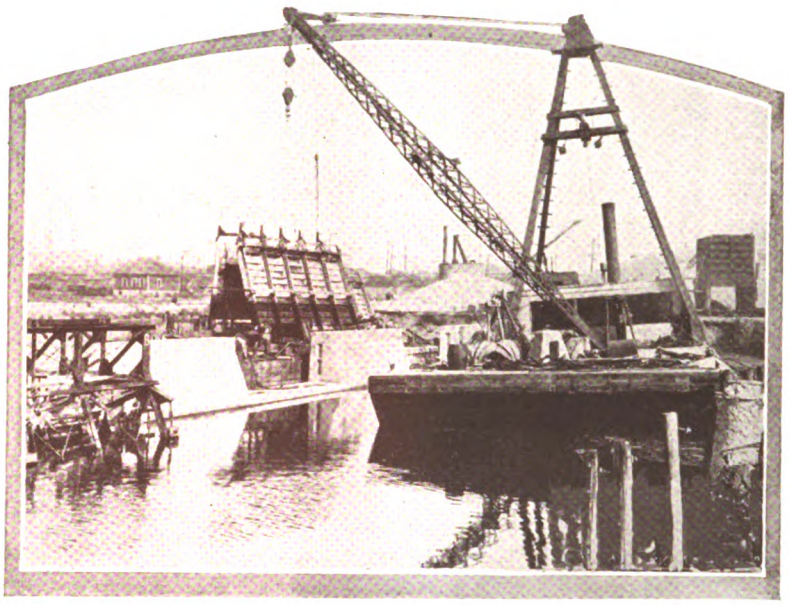
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The Last Word in Sub-Aqueous Concreting

By James Steelman

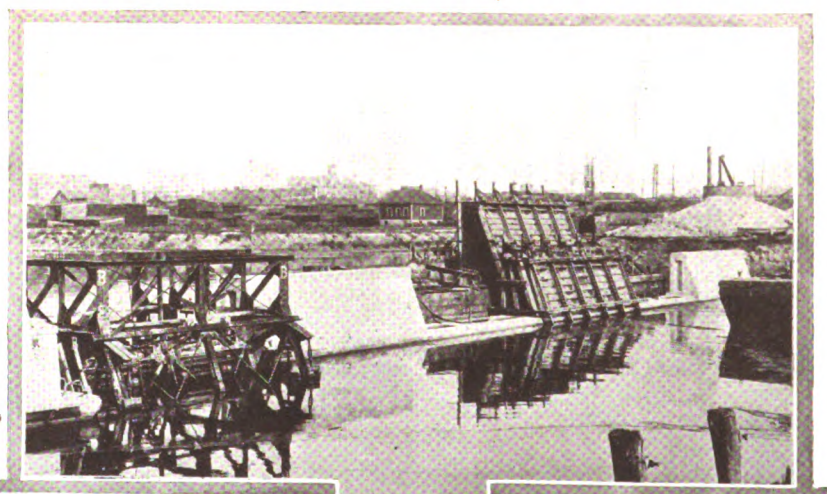
WHILE Americans did not invent the modern Portland cement, they have, it would seem, been the leaders in the development of its application to construction work. They have been the principal ones to apply the idea of steel reinforcement which in concrete supplies the tensile strength so necessary to a great construction material. The two greatest applications of concrete have been in connection with the Panama Canal and the Catskill Aqueduct. Together, these mighty works have absorbed some 10,000,000 cubic yards. But everywhere and in all kinds of undertakings, Americans have shown their faith in this material. The first big ocean-going concrete ship, the *Faith*, was launched on the Pacific Coast of the United States. Oil tankers of concrete, grain elevators of concrete, great bridges, great dams, great hydro-electric stations have been built and put in operation. Even concrete pipe lines of large diameter have been constructed and put into service. In all the foregoing types of construction, Americans have good claims to leadership, although in some cases—as in the matter of concrete boats—they have perhaps not been the originators of the germinal effort. There is, however, one line of concrete construction in which Americans were somewhat slow. I refer to harbor works and construction of a like character. Apparently, American engineers have only gradually accepted the idea of using concrete where it is partly submerged, partly in the air, and partly in a region between wind and tide. But all that is passing now. The great dry-dock at Pearl Harbor, in the Hawaiian Islands, Municipal Docks on the New York waterfront, and the use of concrete in San Francisco Harbor are all instances of the faith of Americans in the suitability of modern concrete for salt-water conditions.

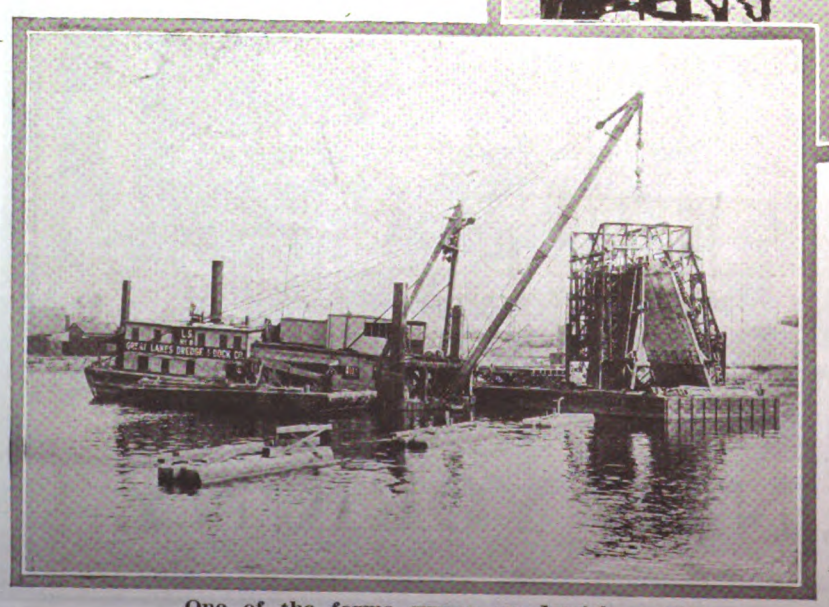
One of the great problems in submerged construction, whether the water be salt or fresh, concerns the methods of putting the concrete in place. Some put the concrete in bags which might be dumped in position or be placed by divers. Some laid the site bare and dry by means of great cofferdams and then built the works in the dry. Some constructed the work in sections on the land and put the blocks, etc., in place after the concrete had sufficiently matured. In later years, particularly in American work, the tremie has come into service as a means of satisfactorily placing concrete under water without the necessity of laying the site bare.



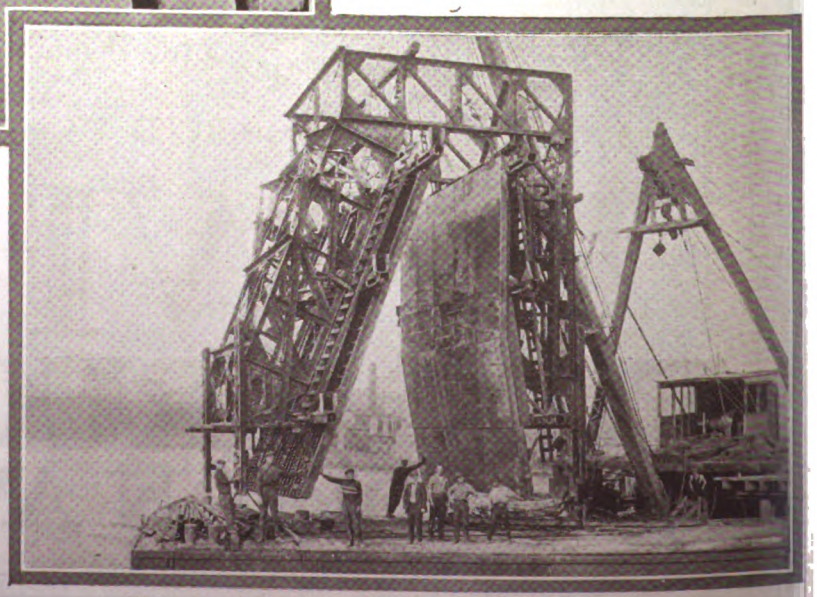
One of the open-end forms used for casting dock-wall at Ohio Basin, Buffalo. Top of wall is seven feet above water.

Below—Closed-end form in position. Note how alternate sections are left to be cast in open-end form.





One of the forms swung on derrick, ready to be placed for pouring of intermediate sections as shown in foreground



Close-up of form, showing its size, as well as the wooden lagging (left side of form) made to conform to harbor bottom.

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This method is simple and well worth the reader's attention. A long tube is let down into the water and the underwater end put at the point where concrete is wanted. At the upper end, a kind of hopper is provided. Concrete is heavier than water, so that if the hopper is kept full, and the lower end is adjusted continually at the proper point relative to the body of concrete already poured, the water will be forced out of the tube and a continuous flow of concrete maintained. The new concrete will not flow through any water but will always be in contact with concrete a trifle older. This, in brief, is the tremie method, and a splendid method it is when intelligently employed. It was used in placing concrete over the steel tubes for the tunnels across and at the bottom of the Detroit River and for certain New York Subway tubes beneath the Harlem River.

In certain work on the New York State Barge Canal, now approaching completion, the tremie has been specified as permissible for the placing of concrete under water.

The use of the cofferdam is apt to be frightfully expensive and it does not always facilitate expedition in construction. Because of such reasons, contractors and engineers may be expected to favor other methods where success is reasonably certain. A case in point is a big job being done by the Great Lakes Dredge and Dock Company at the Buffalo terminal of the Barge Canal. Here harbor works of the Ohio Basin have for a number of years been under construction. The retaining walls at the entrance have been in place for some time. They were built inside of a cofferdam. Certain parts of the dock wall around the Basin are being constructed by different methods.

That is, gigantic steel forms, which were specially designed by the Blaw-Knox Co., are sunk in position and concrete poured under water. The forms restrain and give shape to the concrete. The principal part of this construction consists of a dock wall over a quarter of a mile in length. Sections of this wall about 20 feet long are poured one at a time. But the sections are not poured consecutively. One movable form has the duty of molding every other block or section; while a second form fills in the 20-foot intervals left by its predecessor. The advance form must accordingly provide end walls, but the follower is under no such requirement, because of the ends of the sections already in position. For the work of placing the concrete, no divers are required. But there is a certain amount of minor work connected with shifting or placing the great form for which a diver may be used to advantage.

This wall 1550 feet long is required to be founded on the bedrock at levels varying from 21 to 28 feet below the normal water surface. However, the wall extends upwards above the water a space of 7 feet or so. Naturally, this wall has a front or harbor face and also a rear one. Of course, the water in the Basin exerts a horizontal thrust which the wall must resist. This thrust is nothing at all at the surface of the water, but gradually increases as depth is gained. At 28 feet below, the horizontal pressure amounts to 12 pounds per square inch. The weight of the concrete is itself largely relied on to supply the requisite resistance. Accordingly, the wall is made thicker and thicker from above down. On the harbor face, a vertical surface is desired because of the mooring and the like of the barges and boats. In the present case, the harbor face is given a vertical surface down to near the bottom of the water. From this level down to rock, the wall is steep but it is not quite vertical. The object is probably to give a proper resistance to overturning into the harbor. At the rear, the wall is a simple, fairly steep inclined plane.

Apparently, the natural conditions of the rock and soil at the water's edge are unsuited to furnish a proper backing for the wall, as the forms provide both for front and rear faces. So, then, the forms must hold the concrete front and back. The water helps as it exerts horizontal pressure both ways. But as concrete is much heavier than water, there is a residual horizontal pressure seeking to push the front and back forms away from each other. If we put the specific gravity of the concrete no higher than 2, water being 1, the residual pressure will equal 18 pounds to the square inch at the base of a 35-foot wall, with 7 feet above water. It will readily be seen, then, that whatever design is adopted for the forms, it must provide for this pressure.

But this is not the only problem that must be adequately solved. The top of the wall is naturally level or nearly so. But the bottom has all sorts of irregularity. This is due to the fact that the rock is naturally uneven and to the further consideration that it would be quite expensive to make it level. No, the wall itself must rise and fall on its under surface. Because of the irregularity of the rock support, the rock surface varying from 21 to 28 feet below the normal water surface, the form for the concrete must be adjustable—or rather, it must be capable of being made to conform to the variations.

The form is of steel, and consists first of a rigid frame not unlike our inverted capital L or a Greek gamma (Γ). The front and rear forms for the two wall faces are suspended from this structure. The form which molds the harbor face of the wall is a bent surface next the upright of the gamma. This surface consists of two planes which intersect along a horizontal line and thus provide for the vertical and steeply inclined surfaces already mentioned. The form for the rear hangs from the center of the cantilever arm of the gamma and is backed by strong steel work. The whole affair is about 40 feet high—that is, as tall as a three story house. The length is about 20 feet, and the breadth (from front to back) is about the same. So we have here a great, big affair. It weighs upwards of 60 tons, and is in addition an unwieldy mass of steel work However, 60 tons is no great matter for a big A-frame and hoisting boom. As the form goes down into the water, the weight falls off a bit.

The front and back forms consist principally of steel plates, but wooden lagging is provided near the bottom. This arrangement is with a view of accommodating the irregularity of the rock bottom. Here is one of the problems already mentioned. The exact contour of the rock surface is ascertained before letting down the great form and the wooden part trimmed to suit. Work was begun where the wall would have its base at the lowest level, so that as time has gone on, the adjustments have probably been those which could be accomplished by cutting away rather than by adding on.

It will be remembered that one form is used with end walls and the other without. These end walls, or end bulkheads, are so fashioned that they may go with the form or be removed separately. Big bars of steel extend lengthwise and back of the face forms. To these the bulkheads are removably secured. The horizontal pressures against these bulkheads are just as severe as those against the forms for the faces. These pressures are, however, endured by the longitudinal bars. The pressures against the face forms are transmitted largely to rods extending from front to rear.

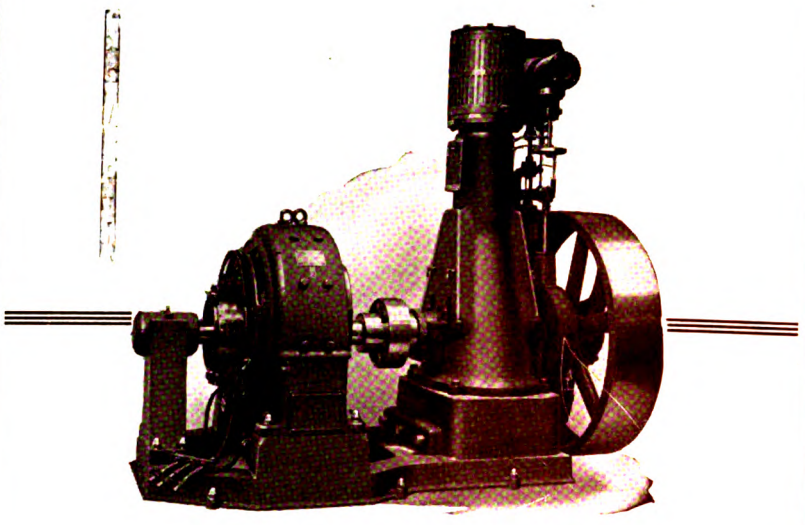
When the form properly adjusted is let down by the big derrick already referred to, it is rested on four adjustable posts. These are located at the four corners of the steel work. Naturally, these require adjustment as to their several heights in order to provide a suitable support. This is accomplished by means of screw jacks or by the proper use of bolts. These adjustments of the legs of the big affair are made before it is submerged. In short, when the great form is let down into the water it is ready to come properly to rest on the uneven rock and afford a suitable form for the wall.

The methods by which the necessary data are secured in advance of submergence are of interest. There is a big sounding raft 30 feet wide and twice as long. Open spaces are provided in the deck through which soundings are taken by means of a wooden pole shod with a steel point. In accordance with the measurements thus secured, the configuration of the rock surface is ascertained. This all sounds simple, but there are difficulties in

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the way of actual accomplishment. The surface of the water varies in respect to its elevation, but the rock surface below does not. This is no great difficulty, however, as the soundings may readily be corrected. But the rise and fall of the water makes it difficult to maintain the raft in exactly one position over the site of the base of the wall.

Spuds constitute a usual resource which is adopted when it is desired to maintain a barge or raft steadily in one position. Ordinarily, they are timbers with pointed ends which may be made to pierce the layer of earthy material at the bottom and thus provide a kind of upright or brace. In the present case, the fluctuation in the level of the water had to be taken into account. So, the spuds were made of 4-inch steel piping and casings of 5-inch piping provided to envelop the spuds. With the casings fixed in position on the raft, the spuds could remain fixed in the earthy bottom and perform their duty of holding the raft over the site. The soundings are taken lengthwise of the wall foundation and cross-wise as well. These may then be corrected in accordance with the water level that day or hour. It will be seen that a good deal of preliminary work has to be done in carrying out such a procedure as that at Buffalo.

Assume, now, that the form has been prepared to suit this exact configuration of the foundation ledge and that it has been let down into position. The ledge may still be covered with a good deal of mud and debris. To leave such material would endanger the integrity and stability of the completed wall. What is desired is a close-fitting contact with the actually immovable rock. A centrifugal pump is made to clear the surface by operating a suction pipe over it, but subsequently to a loosening up of the mud, etc., effected by water jets directed by divers. Before any concrete is put in place, the surface is examined by one or more divers.

The actual placing of the concrete is done by means of a bottom-dump bucket. This is operated from a long boom set up on the mixing scow. A typical section of concrete can be put in position up to a point one foot above the water in the course of an 8-hour shift. The top part of the wall is poured in the usual manner. But before this is done, an examination of the under-water concrete is made. Test wells, reaching down into the concrete, and having a diameter of 2-½ feet, are employed for the purpose. Then the wells are filled and the upper part of the wall poured.

Novel Method of Street Cleaning

By Robert H. Moulton

Baker, Oregon, a town with a population of about ten thousand and an unusually large percentage of paved streets, has hit upon a novel method of cleaning its thoroughfares. The source of the town's water supply is a large reservoir, fed by mountain streams and located on the top of a mountain about a thousand feet above street level. At this height the pressure of the water under gravity is so great that it will easily throw a stream from an ordinary fire hose a distance of a hundred feet, making fire engines unnecessary.

With fire plugs on every block, it occurred to one of the town officials that here was a means of flushing the streets. The only trouble was that the plugs were too far apart to allow of more than half a block being cleaned at one time, unless a hose of such length was used that its weight would make it difficult to handle. The problem was solved by making a flexible hose composed of sections of iron pipe three inches in diameter and about ten feet long, and joining them together with short pieces of rubber hose. The whole pipe was then mounted on little iron wheels placed at convenient intervals, a nozzle attached to the far end, and a horse hitched to it to draw it about. The hose is about 500 feet long and, being flexible, can be turned in any direction or even doubled on itself. The hose throws a powerful stream of water which effectively breaks up and washes away all street refuse.

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Let us illustrate with a single concrete example:

Alexander Pitkethley occupied an obscure position with the Chevrolet Motor Company. To quote his own letter he was "floundering about, failing to make any appreciable headway."

Mr. Pitkethley and a representative of the Alexander Hamilton Institute sat down together for an hour in the frankest kind of a personal talk. The Institute man brought to Mr. Pitkethley not merely an explanation of the Modern Business Course and Service; he brought, from his experience as the adviser of hundreds of other men, a judgment and a vision that caused Mr. Pitkethley *for the first time* to analyze himself and his future, and see definitely just how he could begin to make progress.

Today Mr. Pitkethley is Assistant to the Factory Manager of the company. He will go higher, his progress has only begun. But suppose he were to stop where he is. The increase in his present income over the income he was receiving on the day when he sat down with the Institute man is 200%. Multiply that by the next fifteen years and you have a total of many thousands of dollars in added cash income—surely a rich reward for an hour's frank talk.

This council is offered freely to you

The men who represent the Alexander Hamilton Institute are seasoned, successful business men. Every year they become more trustworthy advisers because more and more men confide their problems to them, just as a physician becomes a more trustworthy physician with each added year of diagnosis and cures.

Some day one of these men may call on you. If he does, welcome him; the counsel he brings has meant *everything* to many men whose problems were much the same as yours.

But it may be a year before he calls; two years perhaps; or three or five. Can you afford to wait that long for the analysis and definite plan that have helped thousands of men to increased success? Can you afford to pay for delay at the rate of $1,000 or $2,000 or $5,000 a year?

Send for this book

The facts about the Institute's training and the answers to every question you are likely to raise have been gathered into a 118-page booklet, "Forging Ahead in Business." As a first step to larger success will you spend one evening with this book? It will be sent without obligation to any man of serious purpose. For your convenience the coupon is attached; fill it in and mail it today.

Alexander Hamilton Institute
448 Astor Place: New York City

Send me "Forging Ahead in Business" which I may keep without obligation.

Name.....
Print here

Business Address.....

Business Position.....

Canadian address, C.P.R. Building, Toronto; Australian address, 42 Hunter St., Sydney

Copyright, 1922, Alexander Hamilton Institute

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"Telling the World," a Reality Instead of a Figure of Speech

(*Continued from Page 9*)

was by the electric arc, which not only required power out of all proportion to the distance attained, but was unsatisfactory in many other respects.

Through the inventive genius of Professor J. A. Fleming (who invented the thermionic valve) and Dr. Lee De Forest, the Vacuum Tube was born. And the Vacuum Tube is to wireless telephony what the internal combustion motor is to the airplane: converting a theoretical possibility into an actual, practical accomplishment. Yet, although the Vacuum Tube, or Audion, was known and used more than ten years ago, its real possibilities remained to be discovered by an amateur.

In the latter part of 1912, Edwin J. Armstrong, a young amateur operator living in Yonkers, N. Y., experimenting with a new "hook-up" of his apparatus, was startled to hear clearly the signals of the station in Clifden, Ireland, more than 3,000 miles away. Further experiments convinced him that he had discovered something of tremendous importance, and he succeeded in obtaining a patent on the invention of the Armstrong Regenerative Circuit; his rights as inventor being upheld in a decision rendered by Judge Mayer in the United States District Court, on March 15th, this year.

Briefly, the Vacuum Tube and the Armstrong Regenerative Circuit make possible the transmission of sound over distances unthinkable before, and with a fraction of the power required by previous methods. Not only is the Vacuum Tube many times more sensitive, as a detector, than the crystal, but by means of the regenerative circuit it is possible to *amplify* the received signals by passing them again through another Vacuum Tube, so that their strength is multiplied many times. In consequence, where from ten to twenty-five miles was the limit of distance for receiving sound-transmission from a powerful arc transmitter a few years ago, today commercial stations are talking halfway around the world—not in code, but in actual speech.

In November, 1920, the Westinghouse Company broadcasted the first news event—the election of President Harding. Several amateurs, equipped with sending apparatus, followed this lead by sending out phonograph concerts at stated hours of the evening, for the benefit of nearby amateur receiving stations. This met with such a warm welcome that the Westinghouse Company inaugurated, last summer, a regular programme of music and lectures from its Pittsburgh station, whose registered code call is "KDKA." This first commercial broadcasting was followed by others in rapid succession, until today there is no section of the country where the possessor of a good receiving set cannot hear music, weather reports, time

(*Continued on Page 32*)

Will your safe *stay* safe?

Here is a safe that will keep its protective power for its lifetime

WHEN you twirl the combination of this "Y and E" safe at five o'clock, you can forget it till tomorrow!

There is no moisture in its insulation to rust or dry out and leave its contents unprotected.

If your fire comes tonight, or twenty years from tonight, your papers will have the same sturdy protection. *And, remember, nearly every business has a fire sometime during its lifetime.*

If you are not sure about the permanent protection of your present safe, call in a "Y and E" man today and let him explain about the safe that protects permanently—or write for our free safe booklet.

YAWMAN AND ERBE MFG. CO.
Filing System Service, Equipment and Supplies
443 ST. PAUL ST. ROCHESTER, N.Y.
Branches, Agents or Dealers in all principal cities

In Canada:
The Office Specialty Mfg. Co., Ltd.
Newmarket, Ont.



Seven reasons why this safe gives better protection

1. Dry insulation. Corrosion-proof.
2. Best interlocking between door joints and jamb. More steps.
3. Radial door bolts. Extra reinforcement against door buckling in case of fire.
4. Yale combination lock with safety trigger.
5. Heavy angle-iron frame work with extra heavy channel iron base.
6. Each safe is "Systematized" with standard "Y and E" wood or steel sections to meet your individual need.
7. Has earned the Underwriters' B Label without the aid of moisture.



"Y and E"
Dry Insulated
SAFE
Underwriters
Class B

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"Can Scrambled Eggs Be Unscrambled?"

—a present day perspective—



"AN Industrial Engineer is a trained diagnostician of business methods. He hasn't a stock system to sell any concern. He is a health doctor to Industry."

"We bring a fresh viewpoint to your problems."

RIGHT now with production at 30 to 70 per cent of normal, profits demand policies based upon the utmost in unprejudiced perspective.

An experience of over thirty years in diagnosing policies and methods "in the other man's business" has enabled us to evolve a formula by which executives may test each contemplated move.

"Straight Talk," an exceedingly informal two minute chat, will help you to hold a true perspective.

A copy is waiting for you, without obligation of course.

McCALL, BROWNELL & CO., Inc.

Aeolian Building, New York

Industrial Engineers Organization Specialists Analytical Accountants

Please pin this to your letterhead

McCall, Brownell & Co., Inc.,
Aeolian Bldg., New York, N. Y.

Date_____

Gentlemen: I should be pleased to receive a complimentary copy of "Straight Talk."

Name_____ Title_____

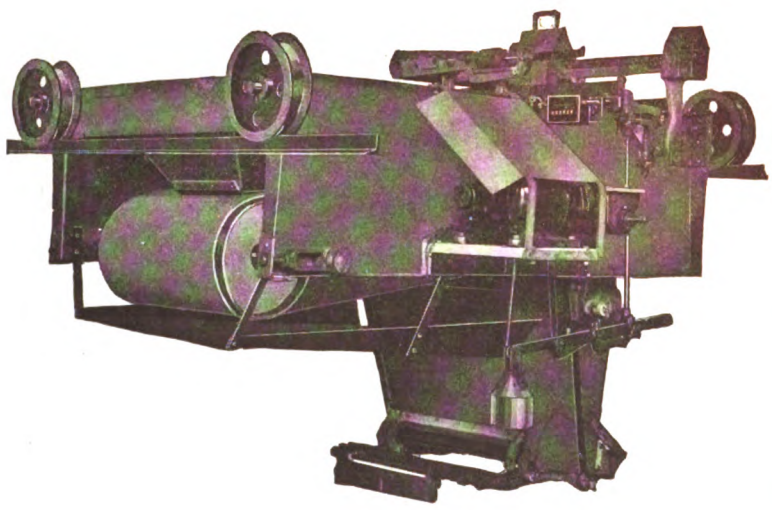
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If Your Boilers are Burning too Much Coal, Find Out Why

Locate the Trouble

Use a Richardson Automatic Coal Scale to Watch Your Consumption



If a boiler uses an extravagant amount of coal, there is something wrong, soot, scale, holes in the fire, etc. And the trouble, if detected in time, can be remedied and you'll get better efficiency and save money on your coal bills.

The RICHARDSON METHOD of weighing coal automatically as it leaves the overhead bunker before delivery to stoker is the practical solution of the problem of unnecessary waste of coal. The obvious advantage of using this machine lies in the fact that *it will weigh any kind of coal accurately.* Wet, damp, muddy or frozen coal won't choke it or interfere with a steady, even supply automatically regulated by the requirements of the stoker. *It's a thoroughly tested machine,* ruggedly built for heavy, continuous service, day and night. Temperature changes in the boiler room don't affect it. *It is a sulphur proof, moisture proof and rust proof scale,* and serves as a dependable barometer for checking the efficiency of your boilers.

Send for descriptive catalogue

RICHARDSON SCALE COMPANY,

Passaic, New Jersey

New York Boston Buffalo Chicago San Francisco

(*Continued from Page 30*)

signals, and talks on a variety of topics.

Far from being a toy or a fad, Radio Broadcasting, in the opinion of scientists and public men, is one of the most important developments in recent times, and its future possibilities are staggering to contemplate. Already, city and state governments are planning to broadcast lectures and even debates on important public measures. A bill has been prepared for introduction in Congress, looking to the installation of a powerful transmitting set whereby the proceedings of Congress will be broadcasted through the ether, so that the people can listen in on the deliberations of their representatives without having to make a journey to Washington. And meanwhile, the General Electric Company at Schenectady is giving to the public a program of entertainment and education (Dr. Steinmetz recently delivered a talk on his lightning generator, at this station), the Radio Corporation of America, The Westinghouse Company at Springfield, Mass., at Pittsburgh, and at Chicago, The Detroit *News,* and a host of other stations scattered over the country, are broadcasting music, news events, crop and market reports, weather reports, Arlington time signals. All that is necessary, to avail oneself of the entertainment and instruction passing through the ether, is the installation of a receiving set. No fees are exacted, and no license is necessary.

One can picture the busy business man of tomorrow: wakened by radio time signal; dressing to the accompaniment of radio music; eating breakfast while the important news of the day is delivered vocally, instead of hiding his grouch behind a newspaper; and spending his evenings listening in comfort to the world's finest music rendered by accomplished artists.

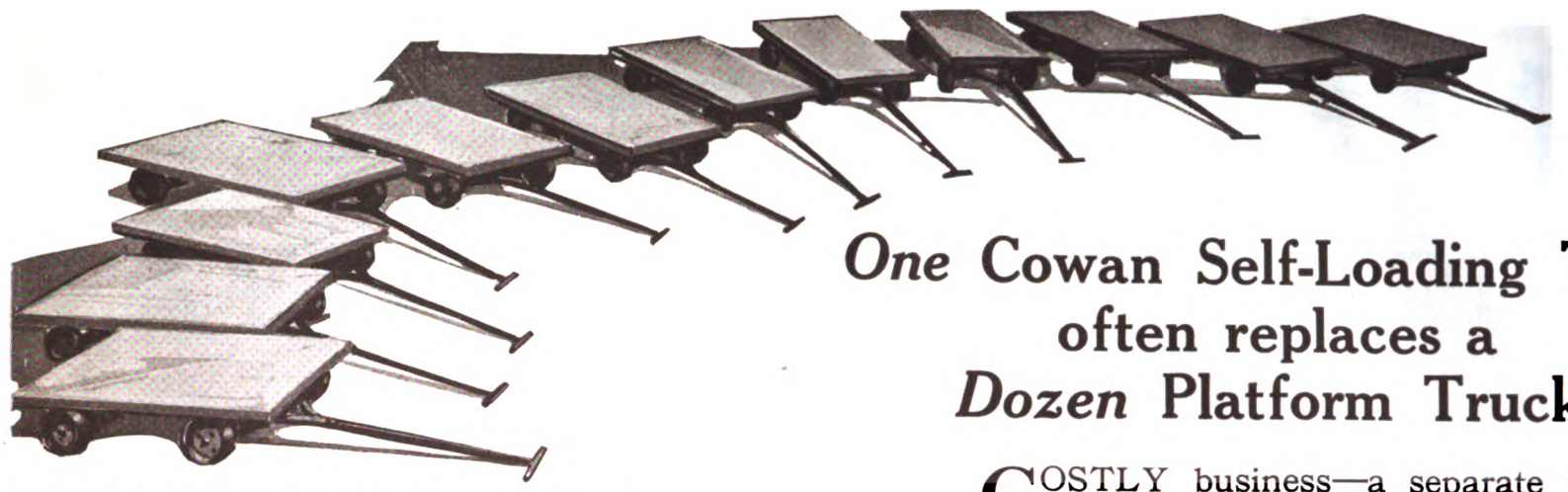
Perhaps, too, when the proceedings of our legislative body are broadcasted by radio, there will be less political oratory and more constructive thinking on the part of those august assemblages. For the ether recognizes neither the Mason and Dixon line nor the existence of farm blocs or other special interests. If radio accomplishes only this, it will have justified itself.

It is easy to be facetious, in looking forward to the possibilities of this new scheme. But, inevitably, the man of tomorrow will be a better educated, more broadly cultured, more widely informed man; because through radio broadcasting he will have an opportunity to learn more easily, he will be brought in touch with good music, and he will hear interesting lectures on a wide range of topics of the day. And that is why broadcasting has come to stay—and to grow even beyond the imagination of any of us today, as a force in the progress of civilization.



Silver Service Room, Hotel Pennsylvania.

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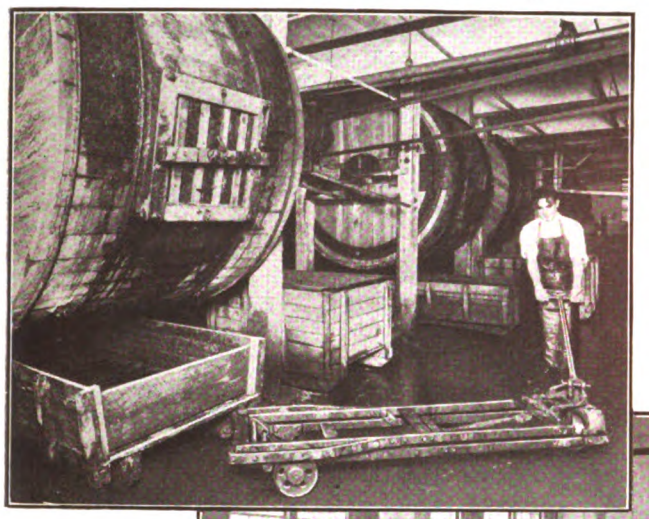
One Cowan Self-Loading Truck often replaces a *Dozen* Platform Trucks

COSTLY business—a separate truck for every load. Unnecessary, too.

An inexpensive Cowan Skid takes the place of a costly platform truck. Simple construction—just a sturdy wooden platform, angle-iron frame, and non-wearing malleable iron legs.

One man and a ***single*** Cowan Self-Loading Hand Truck man serve any number of loads mounted on skids. Skid and load automatically picked up by pressure on foot pedal and single downward movement of truck handle. Again pressing on foot pedal lowers skid and load to floor. No rehandling of load when moved from point to point.

Save on equipment, maintenance, time, and labor in your material handling. A Cowan catalog or a visit from a Cowan representative?



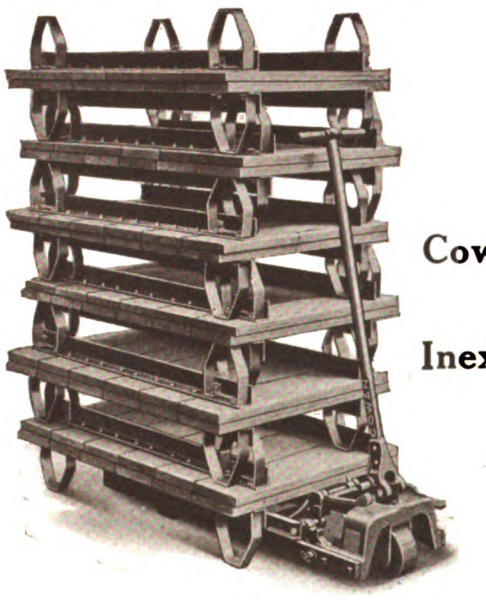
Handling skins in a tannery. Skid boxes and a Cowan Truck.



An ingenious Skid arrangement used in a New England tire plant.



Storage battery boxes handled on skids.



One
Cowan Truck and
Twelve
Inexpensive Skids.

COWAN TRUCK COMPANY, 6 Water Street, Holyoke, Massachusetts

New York Office: Grand Central Palace—Offices in Principal Cities

2037-N

COWAN INDUSTRIAL TRUCKS-TRACTORS

Originators *of the* "through ticket" *system for* moving loads

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Are You Thinking Beyond Your Job?

You can't stand still----if you are not going ahead, you are falling behind.

INDUSTRIAL EXTENSION INSTITUTE,

9 East 45th Street, New York City

The Only Complete Course in Industrial Management

Copyright 1922, Industrial Extension Institute.

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PLAYING THE GAME HARD

A FAMOUS Harvard ex-varsity football player, recently explained his great success at the game in the following words:

"I ate football, I dreamed football, I studied football during every spare moment, and *I played the game hard.*"

The Industrial Extension Institute specializes in training men to become efficient industrial executives. It provides this training through the "Factory Management Course and Service."

The chart on this page shows the scope of the training given thru the "Course and Service." Thousands of men throughout America have enrolled for this training. They know that to win they too must *play the game hard.*

They are thinking beyond their jobs and preparing for the new era of industrial engineering and scientific management.

How They are Doing It

These men are preparing themselves for the opportunities which are open to them, by using their spare moments in studying the principles and best practice of modern industrial management as presented to them in a thoroughly co-ordinated and non-technical form by the "Factory Management Course and Service" of the Industrial Extension Institute.

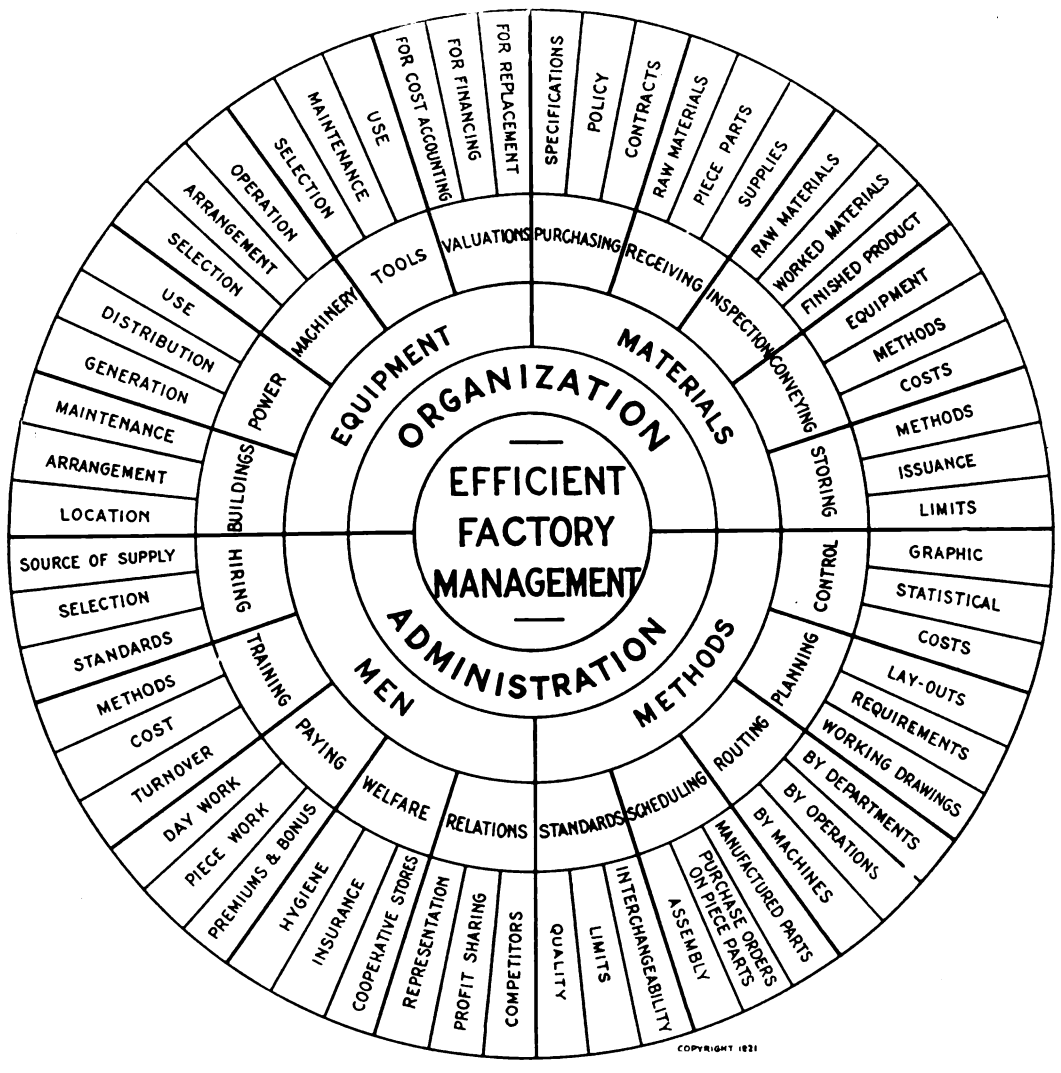
No more striking evidence of the extent to which men are seeking the training which the Institute provides, can be cited than that in a number of industrial organizations one hundred or more men are enrolled for the "Course and Service."

38 per cent. are Presidents and Chief Executives

Thirty-eight per cent. of all the men enrolled with the Institute are Presidents and chief executives. One of these has written as follows;

"The Factory Management Course and Service is a mighty big thing to me and those of my associates who are taking advantage of it. It is the best investment of anything in its line I have ever made and I would like to see every worth-while man in my organization enroll for it."

If you are ***"thinking beyond your job"*** —no matter what that job is—the Industrial Extension Institute can help you on the road to bigger things and greater happiness as a result of achievement, by bringing to you the combined experience of approximately one hundred of the leading industrial specialists of the country thru the "Factory Management Course and Service."



—offers to you an opportunity to make more money and more rapid progress than is possible today in any of the older professions. But you must train yourself for it in exactly the same way as the doctor, lawyer and engineer had to train for their life work—by studying the combined experiences of the men who had gone before them.

Your Opportunity

If you want the next few years to yield bigger returns in the form of more money and greater satisfaction, you must play the game hard. The new era of industrial management is here. From now on the men who become the real leaders in industry will be those who understand the basic principles of modern industrial management and how to apply them.

Thinking Beyond Your Job

"Thinking Beyond Your Job" is the title of a one hundred page book, which tells you in detail just what the "Factory Management Course and Service" is, just how it can help you on the road to greater achievement. It is offered to you, without obligation.

Fill in the coupon and mail it now. Your copy will be promptly forwarded to you.

SIGN THE COUPON. MAIL IT TODAY.

Industrial Extension Institute,
Nine East Forty-fifth Street,
New York City.

Send me "Thinking Beyond Your Job" without obligation.

NAME .....

HOME ADDRESS. .....

POSITION .....

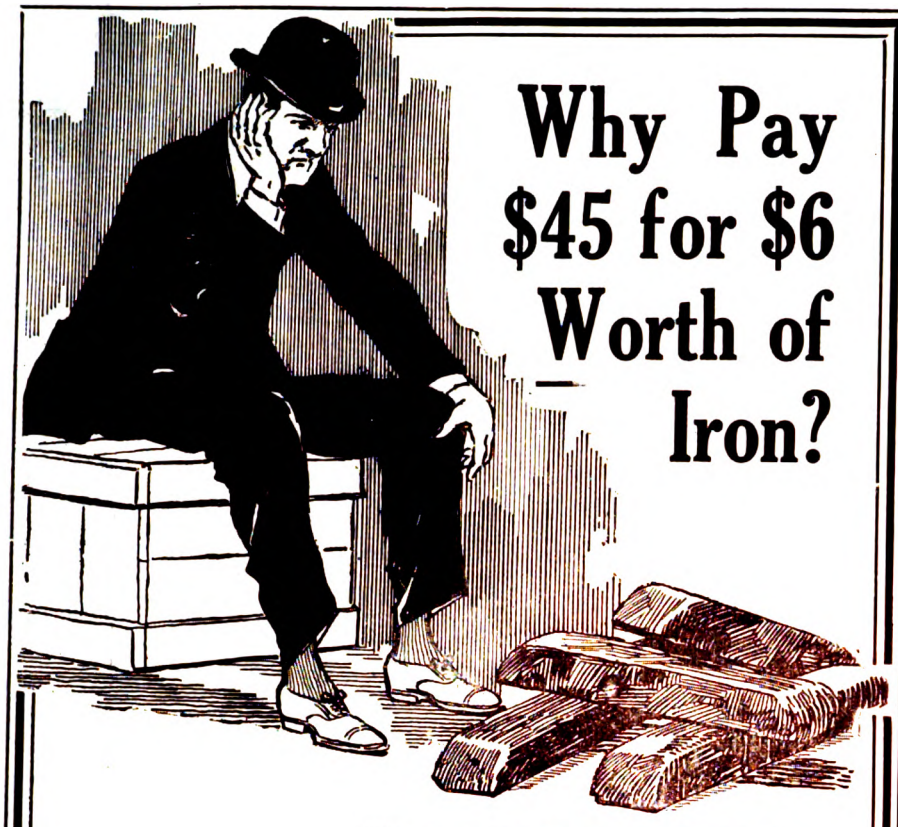
COMPANY .....

COMPANY ADDRESS .....

I. I. APR. 1922.

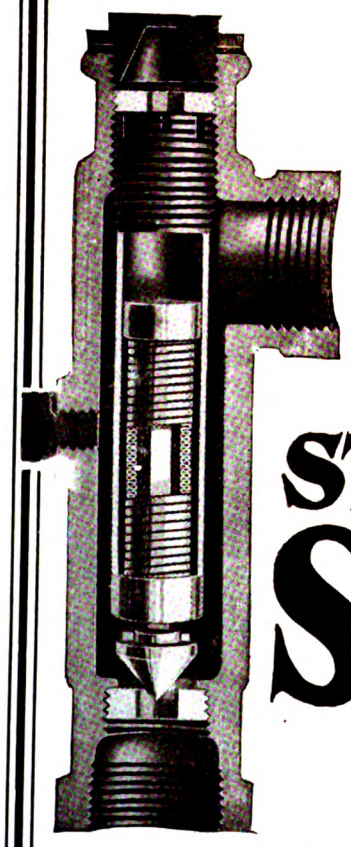
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Why Pay $45 for $6 Worth of Iron?

Why pay $1.50, instead of 2¼c a pound for about 286 pounds of superfluous iron in a steam trap? That is literally what you do when you purchase a cumbersome steam trap of the bucket or float type, with its array of troublesome floats, levers, valves, water gauges, bowls, toggles, packing and other **unnecessary** parts.



The Steam Trap Sarco does everything that the larger, heavier and more complicated traps do. Yet, it has but one moving part and weighs about 6% as much.

STEAM TRAP SARCO

because of its simplicity and light weight, sells for about one-third the price of other makes.

A Sarco saves money in the purchase price as well as in installation cost, for it requires no platform building, no supports, no pit digging.

Can be easily and quickly installed at any point on the line.

Let us send you a Sarco on 30 days' trial. If you are willing to part with it at the end of that time, send it back and the trial will cost you nothing.

Write for Booklet R-9 and full information

SARCO CO. INC.

233 Broadway, New York

Buffalo
Chicago

Philadelphia

Cleveland
Detroit

Vacation Camp of the New York Telephone Girl

(*Continued from Page 21*)

further up, the main house of the camp and the little cottages dotting the side of the hill and partially hiding themselves away among the trees.

This plan for the pleasure and good health of the women employees of the New York Telephone Company had its inception in the dream of a kindly and much beloved man, and the executive ability and enthusiasm of his successors. Edgar F. Sherwood was one of the oldest employes—a pioneer, in fact—of the New York Telephone Company. Always on the operating end, he had much to do with the work of the girls and was interested in their health, happiness, and welfare. It was his dream to have a convalescent home, owned by the company, to which the New York Telephone girls who were run down or were recovering from an illness or an operation might go to recuperate. He had his plans well under way when his sudden death threw the responsibility for the accomplishment of his dream into the competent hands of Mr. T. P. Sylvan, Vice-President of the company, and his assistants on an advisory committee, Messrs. H. J. Schultz, D. D. Field, and E. H. Dyer.

Using a fund contributed by the employes as a nucleus, the company first purchased a beautiful, big, colonial-style farm house and its surrounding farm in the Warwick Hills of Orange County, New York, about three miles from the town of Warwick. This house was remodeled into a convalescent home and named Sherwood Hall in honor of the man whose ambition it had been to establish such a place. With broad verandas, spacious sleeping porches, light, airy bedrooms which offer accommodations at present for fourteen girls, a bright living room, emanating cheer and hominess, and a sunshiny, comfortable dining room where the girls are served with good, wholesome cooking and real farm products, Sherwood Hall indeed spells rest for the weary. Add to these attractions a matron loved by all the girls, who mothers her charges back to good health and spirits, and you can get some idea of what the New York Telephone Company is doing to help its employes to regain health and usefulness.

But the company aims higher than merely to help in rebuilding after the structure has been torn down. On the theory that an ounce of prevention is worth a pound of cure, it extends its operations into a way to help the girls in its employ to retain their health by wholesome outdoor life. With this end in view, it utilized part of its holdings of four hundred acres and built the Sherwood Vacation Camp for the women employes. How well its plan is succeeding is best gauged by visiting the camp and by watching the happy, jolly girls and hearing the songs they have made up to celebrate their very own camp.

Riding about a mile beyond Sherwood Hall, we drew up at the main house of the camp, where the director has her office, and where, also, is the dining hall, with its waxed floor, piano and victrola, and its open fire place. In this big room, furnished with comfortable wicker furniture, the girls can gather on cool evenings or rainy days to dance or to group themselves around the fire to tell stories or to talk and sing.

At one side of the main house is a rack on which hang rows of lanterns. As soon as darkness falls, these lanterns are lighted, making a pretty illumination for the camp until the girls carry them away, one by one, to light them to bed in their sleeping shacks. And those sleeping shacks! It is like playing a game of hide-and-seek to search them out, scattered and hidden away as they are, and peeking out at you from behind clumps of trees. But it is well worth while to hunt them, for, far from being mere shacks, they really are attractive little cottages—ten of them, each arranged to accommodate ten girls. They are all fitted up with things that match each other and—what is more—that are suited to the surroundings—single beds, bureaus, mir-

(*Continued on Page 28*)

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Get Your Foremen With You on Cost Reducing Problems

ALL the planning that is done by your officers and directors, all the carefully considered policies worked out to meet the broad conditions of business, must find their way to the worker through the foreman.

No matter what economies of operation you may plan in the front office, it requires full, whole-hearted team-work, right straight through the factory, to get the results you seek. The policies you plan must find their way to the men in the shop through the foremen, and whether you get labor waste or labor efficiency depends entirely on the way your foremen handle the situation.

To the men in the ranks, the foreman stands for the firm. Only through his executive ability—either natural or trained—can you weld your whole working force into a unit, thinking and acting intelligently with a common purpose and understanding.

Why Foremen Need Special Training

The average foreman gets his job by displaying a noticeable amount of sheer, native ability. As a rule, he is a workman who has risen above his fellows by displaying energy, initiative, and a keener knowledge of machines and processes. He can tell any man under him what to do, and how to do it. He has technical skill far above the average.

In the better plants, however, it is now generally recognized that the successful foreman must be something more than merely a super-workman. He is the "key man," on whom rests the responsibility of leadership in carrying out the policies of the company. He must be trained in the handling of men, and know how, through modern methods, to speed up the flow of production and to hold down costs.

Ordinary Foremen's Meetings Will Not Meet the Situation

Many companies realizing the need of developing the executive ability of their foremen, have sought to fill the gap by conducting regular foremen's meetings, at which the routine problems of the shop are discussed. A far better and more practical plan is to give the foremen and other key men about the plant an intensive group training in modern production methods which will develop their executive ability. Because of their success in adapting this training plan to the peculiar needs of foremen, the Business Training Corporation, of New York, has been engaged to carry on this work in more than 500 leading plants, representing almost every type of industry.

The popularity of the course with the thirty thousand employees enrolled is due to the clear, simple, and eye opening nature of the study methods. The foremen like it because it holds their interest throughout and leaves them with a new insight into their jobs. It has made good with the management because it develops a greater spirit of team work in the plant, energizes the men to more productive effort, and has an appreciable effect in reducing labor turnover and costs.

Your big problem today is economical operation. You should therefore read our brief report "Making Better Foremen," which we gladly send to executives without obligation. It gives all the details of our unique plan, and the experience of some of the well-known concerns who have used it.

Business Training Corporation

"Greater Team Work Through Group Training."

185 Madison Avenue *New York City*

Business Training Corporation 185 Madison Avenue NEW YORK, N. Y.

Send me without obligation the Special Report, "A Plan for Making Better Foremen."

*Name*_____

*Company*_____

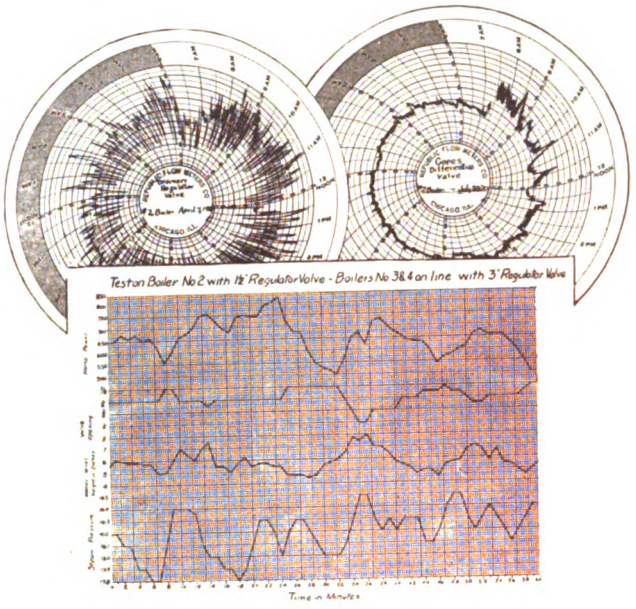
*Address*_____

*Position*_____

*Number of Employees*_____

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DESIGNED TO MEET YOUR CONDITIONS



Every Copes is designed for the specific conditions under which the boiler is to operate. Large factors of safety ensure satisfactory operation on abnormal as well as normal fluctuations in load conditions.

The chart on the left shows water flow with an ordinary regulator valve -- one that simply corresponds to the size of the feed line.

The chart on the right shows the flow to the same boiler when equipped with a Copes Regulator designed for that particular boiler.

Note the improvement.

The lower chart shows how accurately the Copes met the load conditions. Note low water level with heavy loads and high water level with light loads -- this ensures maximum steaming capacity and efficiency.

This is one of the reasons why

COPES
FEED WATER REGULATORS



will save from 2 to 8% of your fuel bill.

In addition they ensure safety and reliability to a degree not obtainable with hand feed.

Prepare for the new era of competition and lower costs by investigating the Copes system now.

Write for Bulletin "K."

NORTHERN EQUIPMENT CO.
101 West 11TH Street . . . Erie, Penn.
Branch Plants: Hamilton, Ont., Canada; Manchester, England; Paris, France; Cologne, Germany

(Continued from Page 36)

rors, closets, warm blankets, everything as comfortable as at home, and pretty tan art curtains trimmed with a darn stitch in browns and golds at windows that may be opened wide to let in the fresh air and the nice woodsy smells.

While you are playing hide-and-seek with the shacks you find the wash house, where the girls are provided with all the conveniences of the city right in the midst of the woods. The wash house is fitted up with porcelain wash basins and with shower baths, and has every arrangement of the best modern bathroom in New York City—even to the advantage of hot water always on tap.

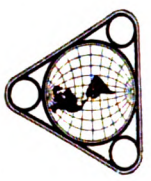
The company has not stopped with merely having comfortable housing arrangements for the girls. Every conceivable sport in which girls usually indulge is arranged for at Camp Sherwood—tennis, basket ball, volley ball, and the rest, and above everything else, swimming. Of all the beautiful places in the whole delightful camp, the most popular spot is the swimming pool. Down in a little ravine, surrounded by trees, a brook has been dammed so as to make a good-sized pool of varying depths to suit either the timid or the venturesome swimmer. Here the girls congregate each day and under the supervision of a competent and careful swimming instructor, have the time of their lives learning to swim and dive.

In the evenings, the girls gather in the recreation hall, an open pavilion on the hill, where they can dance or give impromptu entertainments; or they may build a bonfire back in the woods and have a corn roast. As many of the girls go to the camp over the week-end and arrive on Saturday afternoons, Saturday evenings are made special occasions. In a clearing up on a high knoll, a big camp fire is built. About this fire all the girls come to sing and to get acquainted. The new girls are introduced to the members of the staff and are generally initiated into the joys and mysteries of the camp by meeting the other girls and by being taught the camp songs that they all love to sing.

Besides the fun for which the company has arranged,

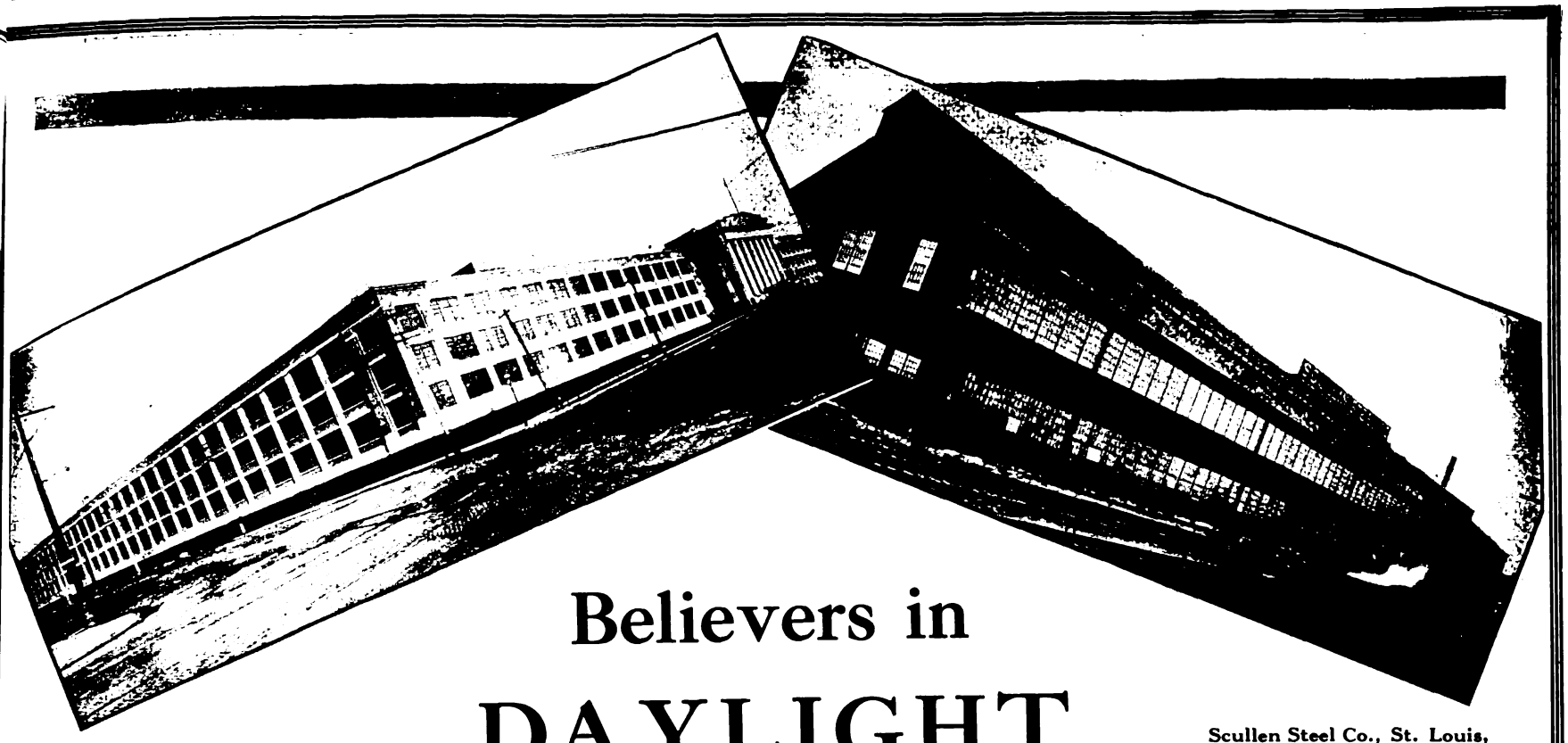
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The J. G. WHITE MANAGEMENT CORPORATION
MANUFACTURING, FINANCIAL AND *MANAGEMENT PROBLEMS*
New York



INVESTIGATIONS and REPORTS ON *BUSINESS CONDITIONS*
43 Exchange Place

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General Motors, Buick Factory, St. Louis Mo. 1/8" Mississippi Ribbed Glass, Mississippi Polished Wire Glass.

Scullen Steel Co., St. Louis, Mo. 1/8" Mississippi Ribbed Glass.

Believers in DAYLIGHT ILLUMINATION

These are a few of the many structures that make efficient use of daylight, while at the same time minimizing fire risks. There are many types and designs of Mississippi Products.....among them, the one that suits YOUR needs.

Ask for catalog and sample of glass suitable for use as a Paperweight

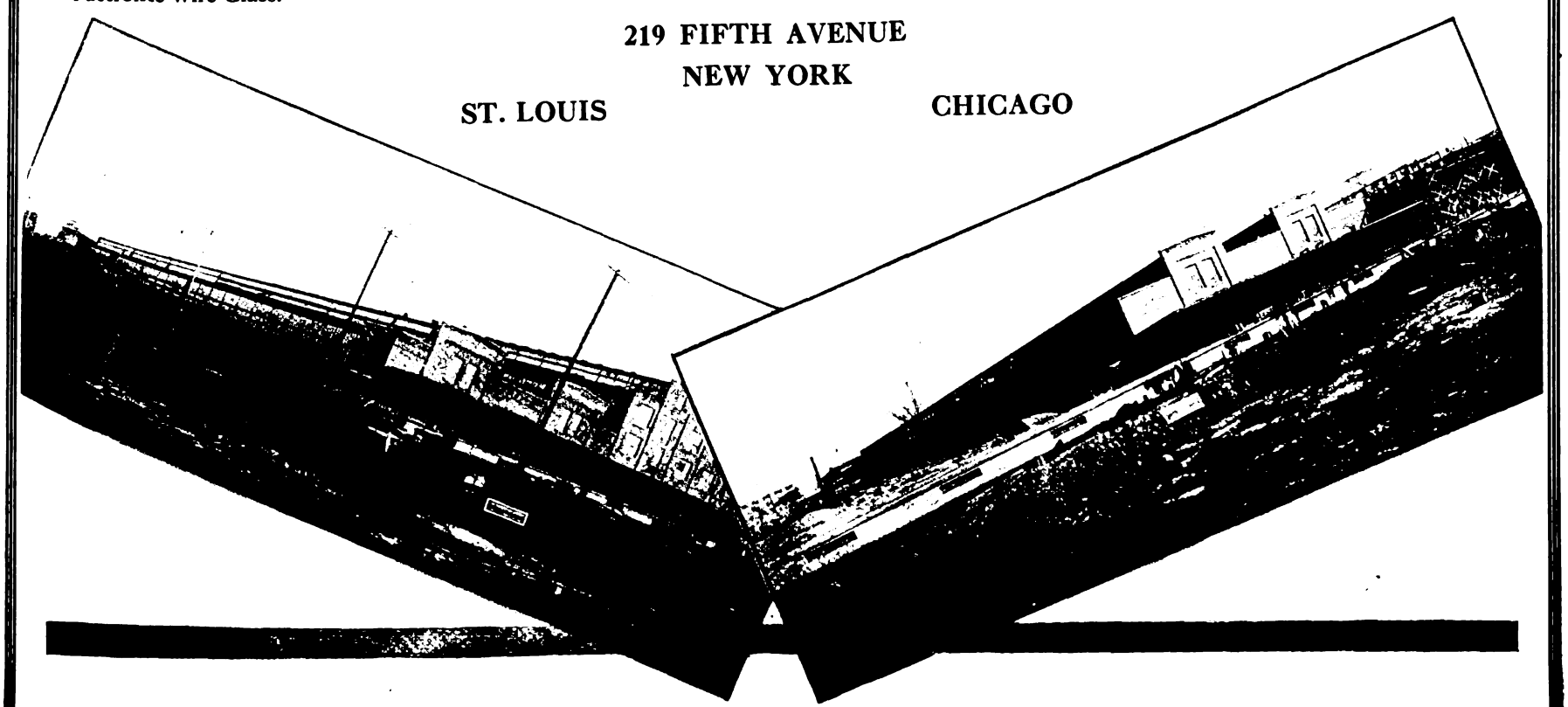
MISSISSIPPI GLASS CO.
MISSISSIPPI WIRE GLASS CO.

219 FIFTH AVENUE
NEW YORK

ST. LOUIS CHICAGO

Dunlop Tire & Rubber Corporation of America at Buffalo, N. Y. 1/8" Goctrolite, 1/4" Factrolite Wire Glass.

Dunlop Tire & Rubber Corporation of America, Buffalo, N. Y. 1/8" Factrolite Glass, 1/4" Factrolite Wire Glass.



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EXPORT - IMPORT - FINANCING

THE present exchange situation offers exceptional opportunities for American concerns of all kinds. We have exported from and imported into the United States tens of thousands of tons of raw products and finished goods. We are equipped by experience and fully organized to attend to all the details of your foreign trade requirements, including the financing of same. Our connections with leading banks in all important European countries enables us to attend to remittances in all exchanges and to the cashing of coupons. We are in a position to advise you, both on the market for exports and on the materials and products which can be imported to advantage.

Northern & Western Finance & Trading Corporation

7 Hanover Street **New York, N. Y.**

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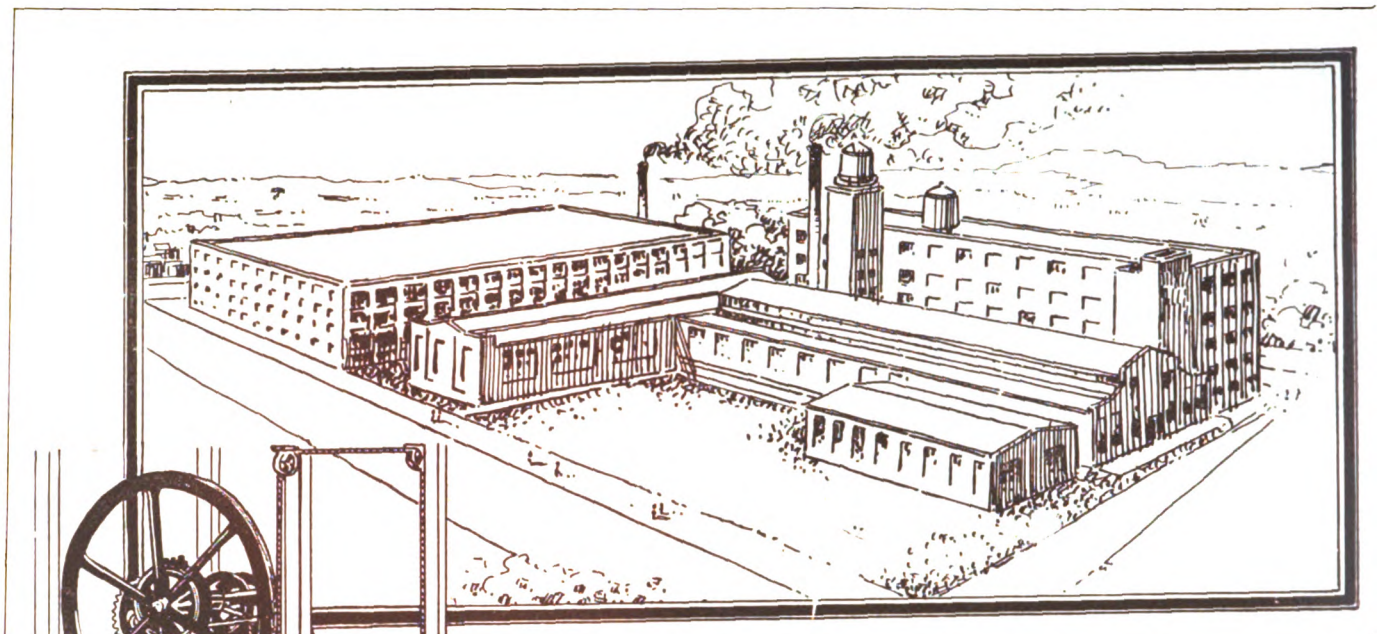
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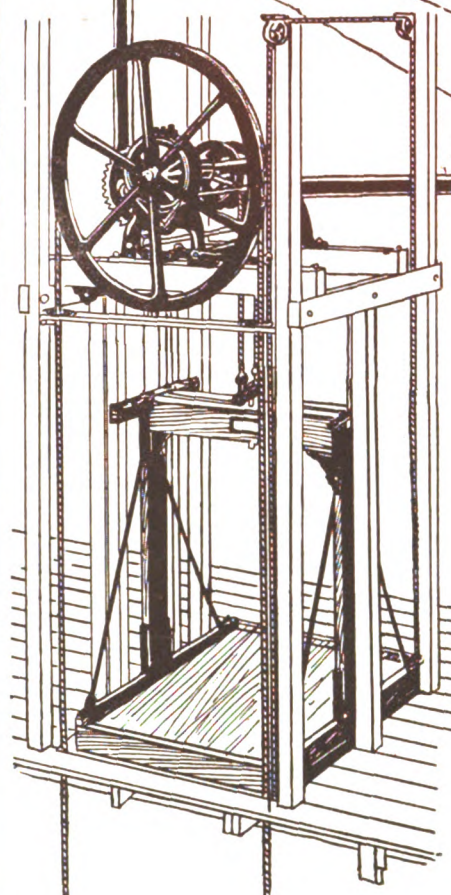
there are hikes and hay rides, visits to the farm, and even baseball games, and no end of other amusements thought out by the ingenuity of the live, wide-awake girls under the leadership of an enthusiastic camp director and her five well-trained assistants. In trying to describe the beauty of the camp lying there in the midst of the woods with the Warwick Hills rising about it, in endeavoring to give an account of the joyousness of even a short stopover there, one naturally must resort to superlatives in language, or, as the girls themselves do, burst into song about it.

They may well celebrate in song the charms of their camp, and they have the additional reason for pride in the fact that it really belongs to them. The company built it for the women employes and expects that the very reasonable charges made for the camp accommodations will make it self-supporting after it gets into running order. Thus every girl who goes there for week-ends or for a vacation has the right to a possessive feeling and to the comfortable sensation of being on her own ground. This realization of ownership inculcates in each girl a sense of responsibility for the wellbeing of the camp, a feeling which is not in the least hampered nor discourgaged by the very capable staff which the New York Telephone Company establishes to take charge.

Besides the camp director, the staff consists of an assistant to the director, two swimming instructors, a physical director, a teacher of arts craft and basket weaving, an efficient clerk who performs the very necessary duty of collecting the money and keeping the records, and a trained nurse. The nurse has a small house, part of which is fitted up as a sort of emergency hospital, with two hospital beds and equipment for first aid in case of accident or slight illness. Of course, a dietitian is included in the camp personnel; indeed is one of the most important members of the staff. One of the few rules of the camp was that the girls should be on time for meals. No such rule was necessary for though the girls might be slow to respond to the bugle which woke them in the morning, they were ready and eager for the bell that summoned them to meals, and no wonder the "eats" were so popular, for they consisted of substantial farm food, all the milk the girls wanted, and many "come-agains." The help in the kitchen last summer was recruited from the dining room department of the home office in New York City.

While the need for the retention of good health and of a wholesome joy in life is a sufficient reason for the establishment of such a camp, possibly the New York Telephone Company had a more subtle underlying motive. In its dealings with its employes, the company makes a real effort to have its people become imbued with the "big family" spirit, and a feeling of co-operation and of friendly acquaintance in every department. So by this camp it provides a medium through which the girls may find out





Speeding Up Production and Reducing Expense

requires adequate facilities for moving materials, tools, products, etc., from floor to floor at lowest cost.

The prominent concerns named below—concerns known everywhere as symbols of business success and efficiency—have found the use of SEDGWICK Dumb Waiters, Hand Power Elevators, and Gravity Lifts, in conjunction with power elevators, the most economical system of quick, adequate and low cost vertical conveying for industrial requirements.

No matter what your business—if your establishment has more than one floor SEDGWICK outfits can save you money. Let us prove it. Tell us your vertical conveying problems. Our advice imposes no obligation on you.

SEDGWICK MACHINE WORKS

Dumb Waiters and Hand Power Elevators

140 West 15th Street, New York, N. Y.

SEDGWICK

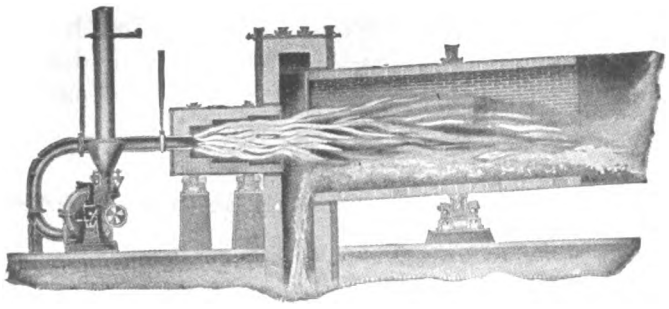
DUMB WAITERS & HAND POWER ELEVATORS

American Bank Note Co.
American Blower Co.
American Car & Foundry Co.
American Cotton Oil Co.
American Druggists Syndicate
American Lead Pencil Co.
American Railway Supply Co.
American Sugar Refining Co.
American Tobacco Co.
Ansonia Clock Co.
Apperson Bros. Automobile Company
Atlas Powder Co.
Berkey & Gay Furniture Co.
Bradley & Hubbard Mfg. Co.
The Bush Terminal
Cadillac Motor Car Co.
The Childs Restaurant Co.
Eastman Kodak Co.
Edison Mfg.. Co.
Edison Phonograph Works
Fleischman Co.
General Motors Truck Co.
Goodrich Tire Co.
Goodrich Tire & Rubber Co.
Kirkman Soap Co.
Louis K. Liggett Co.
Lipton T. J. Tea Co.
Kresge S. S. Co.
National Biscuit Co.
National Cash Register Co.
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N. Y. Edison Co.
N. Y. & N. J. Telephone Co.
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Packard Motor Car Co.
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Pratt & Lambert Varnish Co.
Rushmore Dynamo Works
Seabury & Johnson
Singer Mfg. Co.
Smith Premier Typewriter Company
Standard Oil Co.
Toledo Shipbuilding Co.
Tonawanda Power Co.
United States Ordnance Department
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War Dept. U. S. Govt.
Weber Piano Co.
Western Clock Mfg. Co.
Winchester Repeating Arms Co.
Woolworth F. W. Co.

120-73

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TIME HAS PROVEN YOU CAN USE CHEAP COAL



And use it with positive safety, securing the same thermal efficiency by means of the Aero Pulverizer with slack coal or screenings as with the higher grades. The saving in the cost of fuel is large.

There are now many successful Aero Pulverizer installations to which we will be glad to refer you. The Aero Pulverizer burns coal as pulverized. There is no storage of powdered coal with its attendant hazard.

Write for Catalogue

AERO PULVERIZER CO.

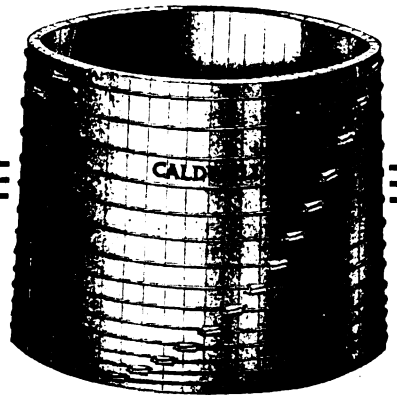
165 BROADWAY NEW YORK, N. Y.

what jolly good times they can have together and may learn to appreciate the company and one another. In sports such as they have at the camp, the girls are acquiring the spirit of pulling together, of team work, which is so necessary for employes to have in order that any large company may be truly successful in its organization and in its service.

The ultimate results from an attempt of this kind are intangible, hard to check up. Often the seed sown is reaped far in the future. The camp was established only last summer; returns are not all in yet. Certainly, however, the members of the company who worked so enthusiastically and untiringly to "put the camp over" may have a very warm feeling about the heart and the belief that their labor was not in vain when they witness even the immediate results in the delight and possessive pride of the girls who were fortunate enough to avail themselves of the privileges of the camp in its first season. As our car drew away from the camp, the girls were singing one of their favorite songs:

"I found a camp in the heart of Warwick,
Ten little shacks among the hills;
In them the girls are always smiling,
For them the sun is forever shining.
There may be camps that are just as pretty,
There may be girls that are just as fine;
But there is just one thing I know,
No matter where I may go,
I'll always say, Sherwood for mine!"

My first impression of Camp Sherwood was of its atmosphere of fun and jollity; my last, of an attitude among the girls of appreciation for what the company has done and of good will and fellowship.



Tight as Solid Wood

With accurately machine-planed joints and rust-resisting iron hoops of correct size and spaced to insure a large factor of safety, a Caldwell Cypress Tank is virtually a solid piece of wood in rigidity and water-tightness.

In addition to the long life of the cypress—the logical tank wood since it grows in water—Caldwell Tanks have the lasting qualities that can be built-in only by long-experienced tank builders.

Send for Catalog

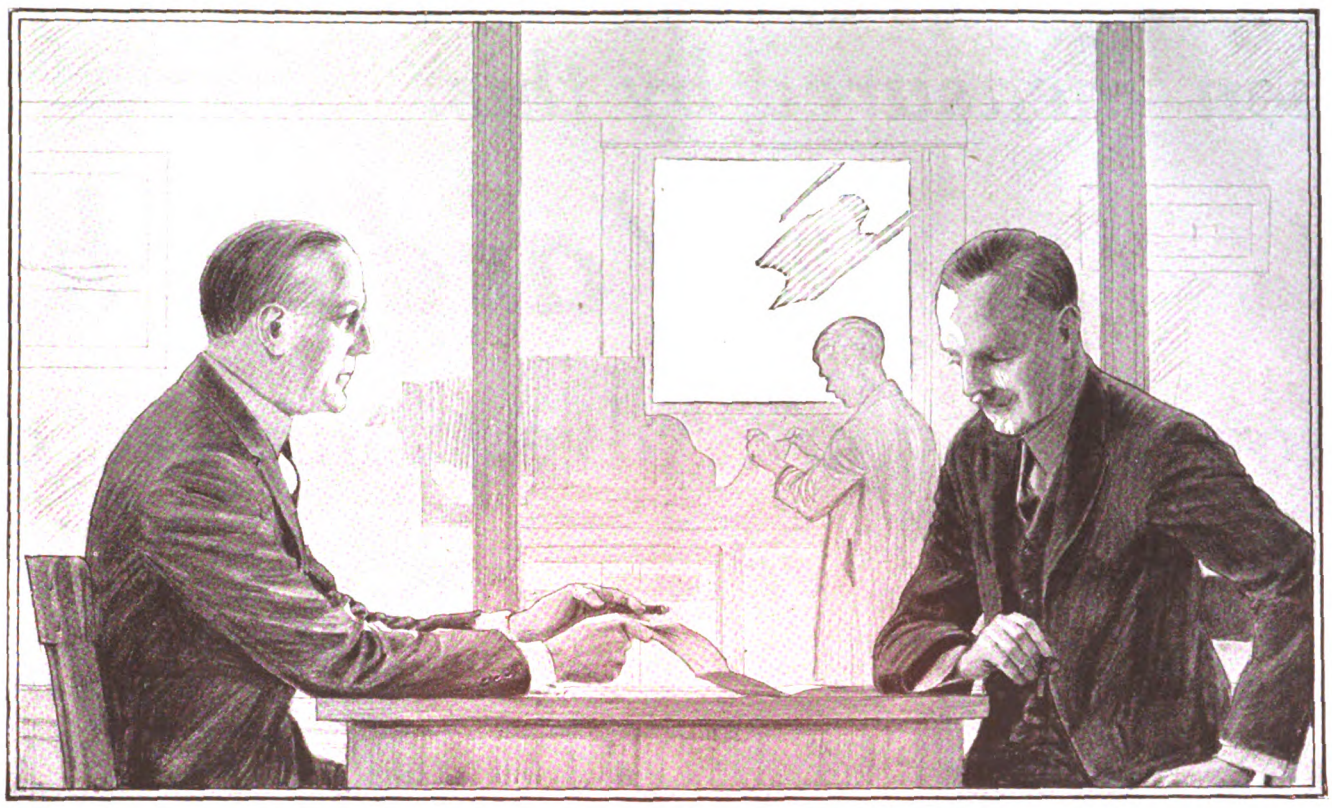
W. E. CALDWELL CO.
INCORPORATED
2200 BROOK ST. LOUISVILLE, KY.

Caldwell TANKS AND TOWERS



The supplying of grease paints for "Movie" make-up is almost an industry in itself.

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"The PHOTOSTAT Put These People on Our Books"

"Up to six months ago we were never able to 'land' any of Judson Company's contracts, because we couldn't make the deliveries they asked for. Then I happened to read Floyd W. Parson's article in the Saturday Evening Post called "The Labor Savers" in which he described the PHOTOSTAT. This machine makes photographic facsimiles directly on sensitized paper of drawings, pencil sketches, blue prints, small machine parts, reports, shipping lists, contracts, catalog pages, maps, production charts, telegrams, advertising layouts and business papers of all kinds.

"We installed a PHOTOSTAT and since that time have been able to get our work into the shop days, and in some cases even weeks, earlier than we used to. The next time we quoted the Judson people we were able to meet their delivery requirements and we landed the contract.

"The PHOTOSTAT makes in a few minutes without error as many copies as we need of the work subjects furnished us, whether they are tracings, pencil sketches or blue prints.

"Now and then we receive a sample of a machine part and are asked to duplicate it. In such cases, if the article isn't too large, we make a PHOTOSTAT print from the article itself, mark the dimensions on the print, thus eliminating the time ordinarily consumed in making drawings, tracings and blue prints, and get started in the shop on the same day.

"The PHOTOSTAT has not only made thousands of dollars for us by helping to get new customers, but has also saved us a great deal of time, money and worry in the office. It relieves the stenographers of a lot of copy work;-does it in far less time and ***never makes a mistake.*** It also saves our advertising man much time in making layouts. And we use it to reduce drawings to convenient size for filing and to copy important documents when we don't want the originals to leave our files. You know PHOTOSTAT copies are legal evidence in court"

In our booklet, "A Good Word for the PHOTOSTAT," many users in widely different industries tell their own experiences with the PHOTOSTAT. Just ask for it.

PHOTOSTAT CORPORATION

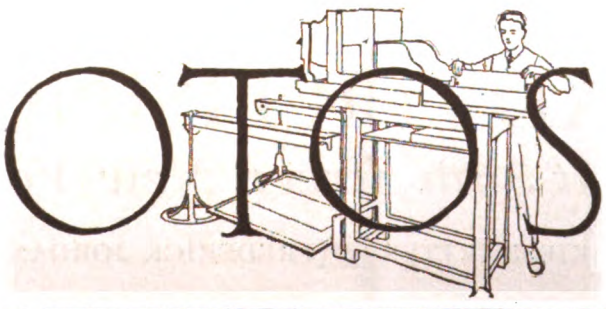
299 State Street, Rochester, N. Y.

88 Broad Street, Boston
19 South LaSalle Street, Chicago
209 Leader Bldg., Cleveland

7 Dey Street, New York City
Executive Office: Providence R. I.

510 North American Bldg., Philadelphia
429 Monadnock Bldg., San Francisco
601 McLachlen Bldg., Washington

PHOTOSTAT



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When measured by this

Yardstick

How does your Advertising size up?

ONE of the difficulties about measuring the worth of advertising has been the lack of the tools of measurement.

Just as it would be difficult to measure a yard of cloth without some sort of rule or tape, it is difficult to measure the value of advertising without some kind of yardstick.

We have undertaken to provide this in "A Yardstick for Measuring the Worth of Your Advertising."

This "Yardstick" is simply a clear statement of the four essentials with which good advertising should conform, plus a few words intended to help measure any particular piece of advertising by these standards.

We shall gladly send you a copy of the "Yardstick," if you will write us on your business stationery.

Send for a copy of the "YARDSTICK"

WALES ADVERTISING CO.

141 West 36th Street, New York

JAMES ALBERT WALES H. M. KIESEWETTER FREDERICK JORDAN WM. RICH CROSS

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Stimulating the Errand Boy

(*Continued from Page 15*)

justs them, figures their time slips, posts data regarding trips and time on Control Board and is judge of all deductions made against boys. In addition to these duties the supervisor takes practically all visitors through the plant.

The clerk, a young man of seventeen years of age, dispatches the boys on their trips and is in charge when the supervisor is out of the Department.

Placing this service under one head enabled us to make a reduction of about thirty-four boys which number involved a disbursement of about $20,000 per year. The smooth running of this department is due to the personality of its supervisor. Experience has shown that the one in charge must have sympathy for the boys and not be stern or unreasonable, yet he must have ability to be firm when it is required. In other words, the supervisor should allow the boys to boss themselves and be able to step in any time to be the boss when so warranted.

No doubt a great many concerns are confronted with the same difficulties which we had to face and overcome. With this fact in mind, and in order that you may be benefited by our experience, we will give some facts regarding the workings of such a system.

The first problem worked out was the factory correspondence system and, as mentioned above, we divided the plant into four sections. Each section was covered by a mail-route. Located in the department headquarters, is a large mail rack divided into 143 compartments, each mail-route stop having its own pigeon hole. Boys collect and deliver the same trip. A double tier wire mail basket is utilized by the boys, which makes it easy to keep separate mail matter collected and that to be delivered. In other words, when the boy leaves the station his lower tier contains mail matter to be delivered and the upper tier accommodates matter collected. Upon their arrival at the station after each trip they sort and place in the proper compartment all mail collected.

In arranging the compartments according to mail-route stops we do away with an extra assorting operation. It can be readily seen, that by placing the stops in this manner, the boys on removing the assorted mail from the rack will have it ready for delivery. That is; mail for stop one will be on top, that for stop two next, and so on—thereby doing away with the necessity of assorting on the trip.

Route one, which covers office departments only, gives thirty-five-minute service. This route contains twenty-nine stops and takes twenty minutes to cover. There are fourteen deliveries and collections daily beginning at 8:08 A. M. and ending at 5:10 P. M. This allows the boy fifteen minutes between trips to assort, rest and make ready for his next trip. A copy of route four is shown in the first illustration, page 15.

Routes two, three and four have from thirty to forty-three stops and cover factory departments only. These routes give fifty-minute service and take about thirty-three minutes to complete, leaving about sixteen minutes for assorting, rest and make ready.

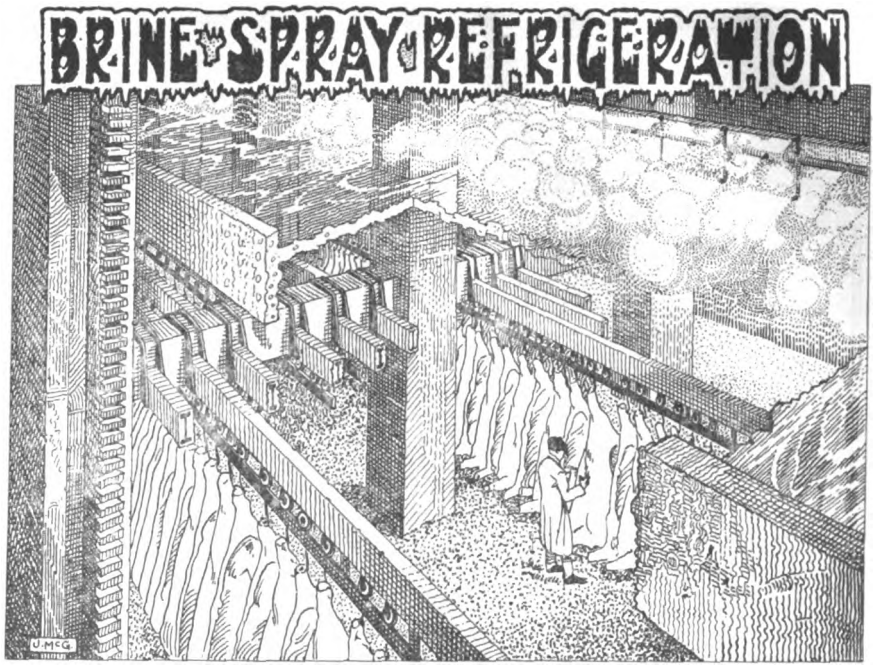
We found that, by placing the mail boys on a bonus, much better service was given. In this way we could rely on the boys covering their routes in schedule time. The bonus in question amounts to $5.00 per month for each mail boy. From this bonus, deductions are made according to the nature of complaints received.

A circular governing the rules of said mail service was issued to every department. Rules in question are as follows:

1—Skipping a mail box containing out-going mail without collecting same.
2—Being more than three minutes ahead of or more than three minutes behind schedule time.
3—Opening mail matter, such as envelopes, folded letters, etc.
4—Losing mail matter or damaging same.
5—Any other legitimate complaint.

Boys are not to be detained for mail that is not ready. Only very small packages will be

(*Continued on Page 47*)



Used Extensively in the Meat Packing Industry

A PAPER read before the American Society of Refrigerating Engineers by S. C. Bloom of Chicago is ready for distribution in reprint form to those who are interested in Brine Spray Refrigeration, the modern method of beef, hog and sheep cooling.

This method of applying Refrigeration is also applied to the cooling of meat products in storage and for maintaining proper atmospheric conditions in offal coolers and other departments of packing plants.

Air Conditioning apparatus involving self-contained dehumidifying equipment with duct distribution for fresh sausage and butterine products as well as apparatus for the scientific drying of summer sausage are also manufactured and installed by us.

Equipment for maintaining artificial atmospheric conditions in practically every type of Industrial plant, where constant temperature and relative humidity must be maintained, regardless of outdoor weather conditions have been furnished by us in numerous instances.

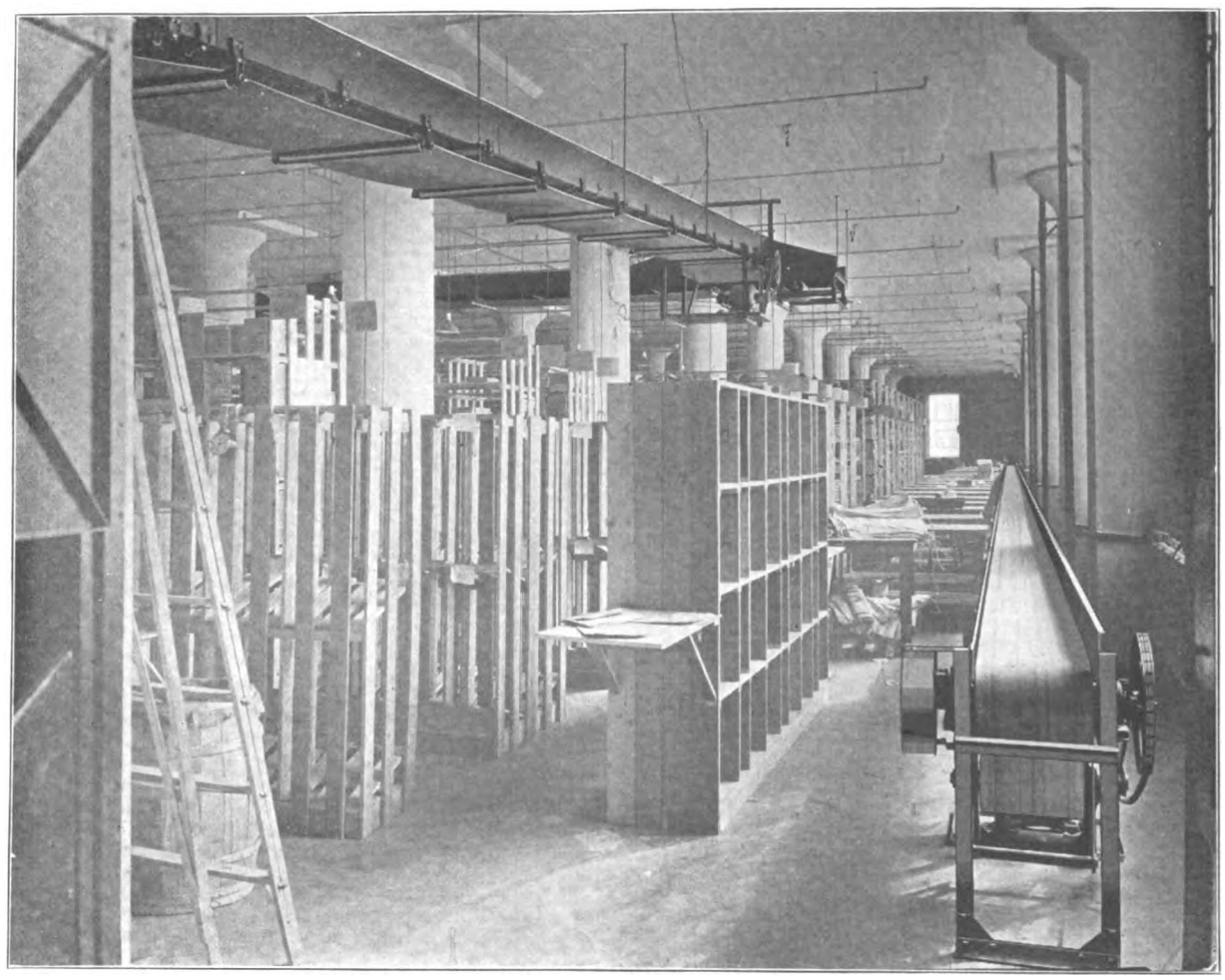
We design, manufacture and install complete equipments for correcting Industrial Ventilation difficulties whereby constant quantity and quality output can be assured, during all seasons and in all climates.

We are in a position to render the manufacturer a real service and while we have literature upon the subject, we invite correspondence and will arrange for conference at which the entire problem may be discussed to the end that a definite proposition can be submitted for the installation of the proper equipment.

Atmospheric Conditioning Corporation
469 Chestnut Street, PHILADELPHIA



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Showing the manner in which belt conveyors can be installed. Note the conveyors hung from ceiling as well as conveyor to the right placed on floor.

Why Did The Diamond Match Company Equip Their Plants with Conveying Systems?

Because they realized that efficient handling of the raw materials entering into their finished product through the various operation stages meant increased production.

Production of a product has its inception the moment raw materials are received and is not completed until the finished product is in shipping room.

Raw materials, products in various stages of completion and the finished product should be handled mechanically in order that production be increased.

A conveying system to be efficient must be designed to conform with individual requirements. Your method of manufacture must be studied carefully in order that the proper system can be developed.

We will gladly have one of our conveyor engineers call and make a survey of your handling problems. Write us at once. This service does not obligate you in any manner.

SAMUEL OLSON & COMPANY

2428 Bloomingdale Ave.
CHICAGO, ILL.

200 5th Ave.
NEW YORK, N. Y.

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(Continued from Page 45)

carried with the mail.

Complaints in question should be made out in written form and sent to the Manager of the Industrial Relations, otherwise they will not be considered.

All complaints found justifiable after investigation will carry with them a fine of ten cents for each complaint against the boy involved to be deducted from bonus allowed. The maximum amount to be deducted at any time will not exceed the amount of bonus due for the month involved.

When boys are absent three days or more their bonus will be prorated.

It is surprising the change in conditions this arrangement has made. Any time of the day one chances to visit this department, he will see four business-like boys attending absolutely to their duties with no cause for interference by the supervisor.

Shortly after the installation of the mail service we established the errand service. The change from the old method to the new was a radical one. It would not have been a surprise if our people had been confused and inconvenienced because of this substitution but as a matter of fact, there was much less difficulty than could have been contemplated.

In the infancy of this errand service, we found that the boys were "falling down on the job" and when the matter was investigated the trouble was nothing more than the want of an additional incentive for their extra efforts. The result was that a thorough investigation was made of the conditions involved, resulting in the granting of a bonus, which is figured on a different basis than the one given to the mail boys. The bonus plan of errand boys works as follows: Because of the conditions of work covered and the difference in the hours of their work, we have two separate incentives. One payment covers those who work only five days per week, with the other covers those working the extra day. In other words, the boys working the full six days are eligible to participate in both incentive payments. This condition is due to the fact that some of our boys are under sixteen years of age and, therefore, according to law are compelled to attend part time school. It was, therefore, thought unfair to these boys if some provision were not made to allow those working part time to receive one bonus and those working the extra day to receive the other.

The basis for figuring the final standing of those involved is by taking the total number of trips made during the month, and the total time consumed in making said trips. The percentage of each boy's share of the total time consumed is subtracted from the percentage of each boy's share of the total trips covered. This is to cover periods of one month. The boy having the highest plus percentage to receive first place; the one with the second highest to receive second place; and so on until the incentive payments have been distributed. The payments are made on the first pay day following the month completed.

Demerits are charged

Direct-Connected Motor Driven Air Compressors

INGERSOLL-RAND CLASS "PRE"

The efficient regulation of the air output by the 5-step Clearance Control is probably the outstanding reason for the success of class "PRE" direct-connected, electric motor-driven compressors.

Efficient Operation at Full and Partial Loads

With this regulation the compressor automatically operates at any one of the five load points, depending upon the demand for air. The compressor will deliver *full, three-quarter, one-half, one-quarter, or none of its capacity* and the horsepower required is practically in proportion to the air output.

Another feature of the 5-step Clearance Control is the Maximum Demand Stop which prevents the compressor being operated at any higher maximum load than is desired. This is extremely important if a maximum demand or service charge is included in your contract for electric current.

We will be pleased to quote on the compressor direct-connected to unity or leading power factor synchronous motor with exceter and panel.

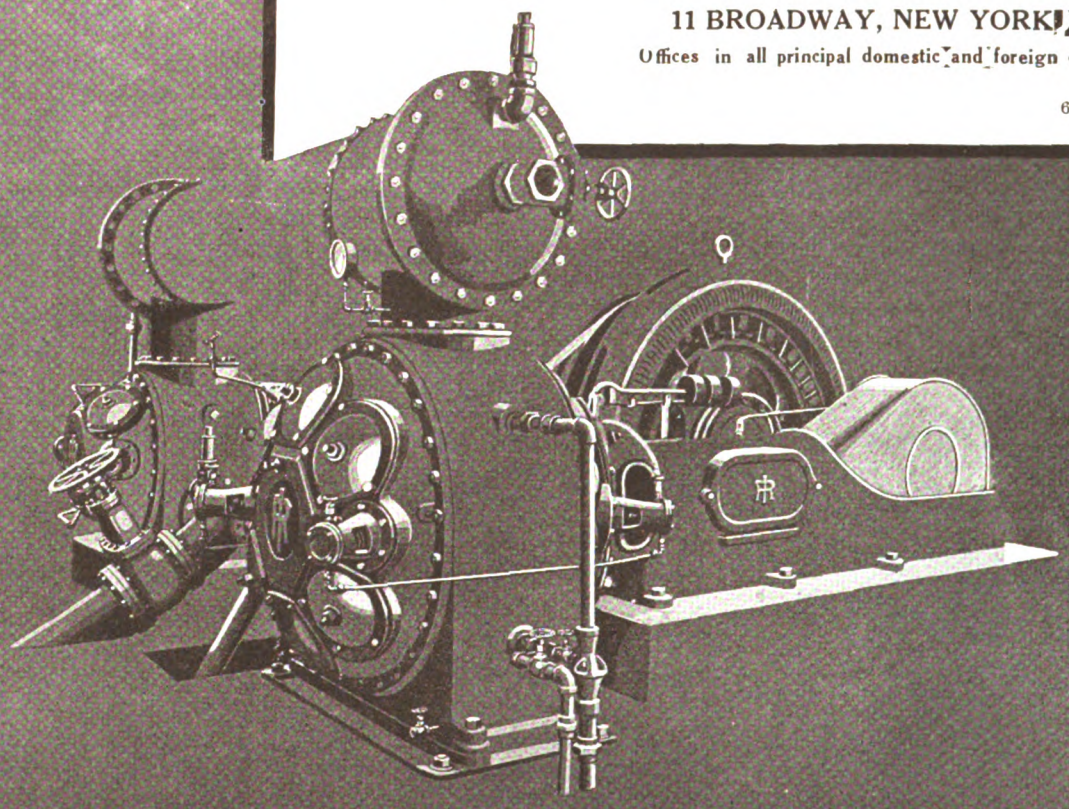
BULLETIN 3126

INGERSOLL-RAND CO.

11 BROADWAY, NEW YORK

Offices in all principal domestic and foreign cities

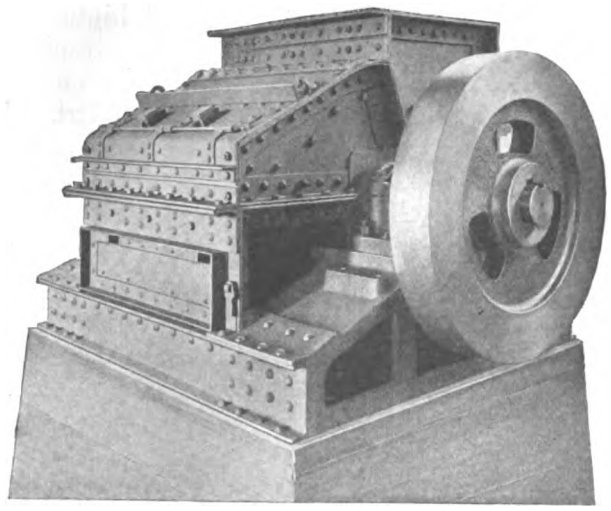
602-C



Ingersoll-Rand

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Taming TRAMP IRON *in*



"PENNSYLVANIA" COAL CRUSHERS

When the "cotters" rattle out of the coupling pins on the long haul from the Mines to Tidewater, and the train goes over the great cardumper, car by car, heavy coupling pins, and an occasional knuckle 'go aboard' with the coal. The tramp iron which accumulates in the mine, and in rail transit, thanks to the track walkers, is equally menacing.

Does this tramp iron make the repair gang sit up nights with your coal conveying and crushing machinery, or your stoker equipment?

It has no terrors for "Pennsylvania" Coal Preparation Machinery, which has been specialized to pick out Tramp Iron automatically, or pass it without damage.

"Pennsylvania" Bradford Breakers, for large Central Stations, Mines, and Gas Works, with almost human precision throw out tramp iron, as per typical sample below, without damage to the machine and without power, labor or supervision.



"Pennsylvania" KINGCOAL Hammer Crushers for preparing stoker sizes are equipped with Patented non-magnetic Tramp Iron Separators, entirely mechanical and automatic in operation which pick out stray iron and require no attention aside from occasional dumping.

"Pennsylvania" Single Roll Crushers are provided with double tramp iron protection in the form of powerful relief springs, which permit the passage of most of the iron encountered, and a steel shear-pin device which operates positively when iron too large to pass between the roll and breaker plate is introduced.

These three types of "Pennsylvania" Coal Preparation Machinery as specialized for Central Stations, Gas Works, By-Product Coke Plants, Industrial Power Plants, Producer Gas Plants and Coal Mines, due to superior design, powerful construction and thorough tramp iron protection, insure a continuous supply of properly prepared coal at minimum cost per ton.

Concise illustrated Bulletins on request.

PUT YOUR COAL PREPARATION PROBLEMS UP TO US

PENNSYLVANIA CRUSHER COMPANY

Stephen Girard Building

23 South 12th Street, Philadelphia

New York Boston Pittsburgh Chicago

against the boys for different reasons, such as disobeying rules; spoiling material; doing wrong errand; and the like. These deductions are in the form of demerits, except when the boy involved wins one of the bonus prizes. Then each demerit is equal to five cents; and no demerit is made until after a warning is given. A certain number of demerits have been agreed upon, and when this figure is reached it automatically dismisses the boy from the service. However, all boys have a chance to cancel their demerits by winning one of the bonus prizes offered. In this way they pay back a nickel for each demerit. The total amount deducted can never be more than the bonus won; also, no boy who fails to win a bonus may purchase his demerits with his own money.

The chairs in the messenger room for the errand boys are numbered and arranged from 1 to 15 in a row. The boy seated on chair No. 1 receives the first call for errand. When he leaves for said errand, all remaining boys move up one chair. The boy after completing his errand returns, and takes nearest chair to No. 1 that is vacant. In this way no partiality is shown. On returning from lunch, the boys who are anxious to get ahead invariably take the first chairs, placing them in a position to receive the first errands coming in. Those coming in late, therefore, lose their chance for early errands and must take up a position at the end of the line.

On exceptional errands, such as being sent out of the plant grounds or on long errands, we take the average number of minutes consumed for one errand by boy in question on the day the exceptional errand is run. For example, a boy, previous to the exceptional errand has accomplished ten errands in one hundred minutes making an average of ten minutes per errand. It requires three hundred minutes to accomplish the exceptional errand. This would mean that we credit the boy thirty trips making his total for the day forty trips in four hundred minutes. This same principle is used on all other trips which can be termed out of the ordinary. Bonus payments are made as follows:

Those working five days (except Saturdays) for full month:
1st, $8.00; 2nd, $6.00; 3rd, $4.00; 4th, $2.00; 5th, $1;
Those working on Saturdays for full month:
1st, $2.00.

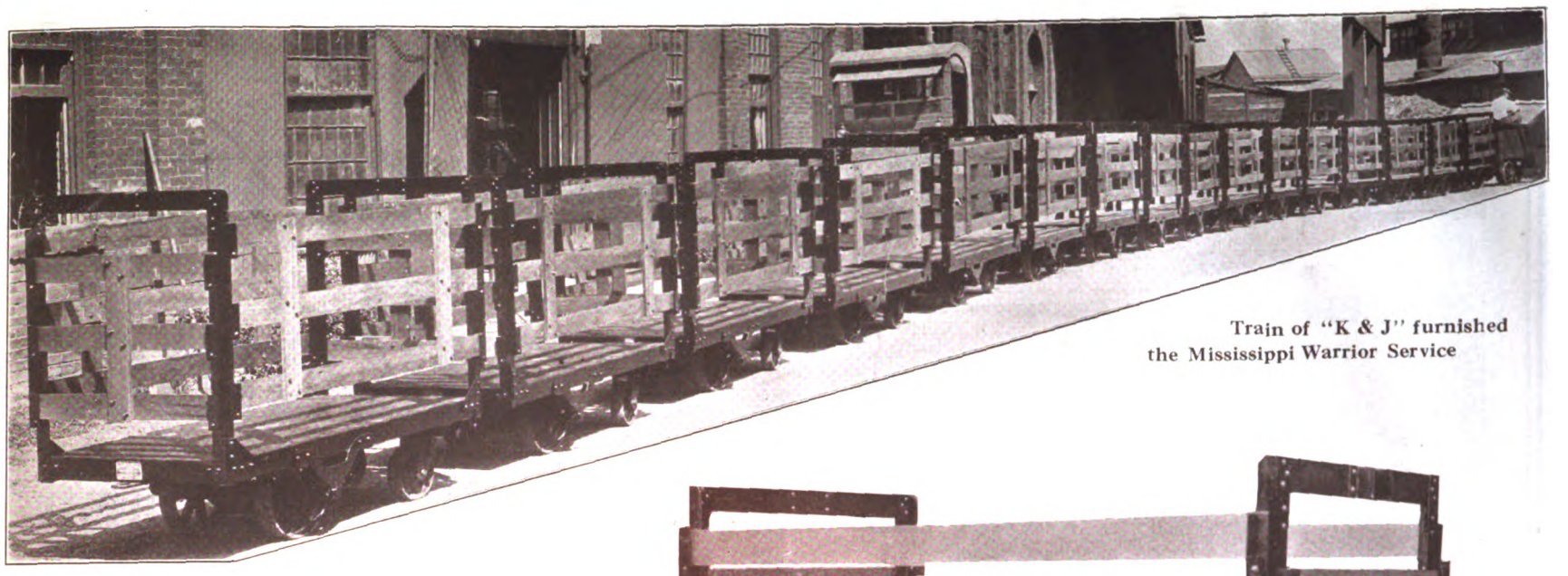
Shortly after this service was installed, a survey was made as to the number of trips accomplished each day by the fourteen boys. We found that three hundred was the average, and that these averaged about fourteen minutes per trip. After the bonus went into effect the number of trips per day gradually increased, and time per trip decreased until now the boys average about seven minutes per trip and cover about seventy-five per day, individually—or 1050 per day in all. It is evident that the bonus plan was the incentive causing the increased efficiency.

Any records that the boys make are posted on their bulletin board, whether it be the greatest number of trips in one full day; best daily average in time, for eighty trips or more in one full day or others. In this way we keep before the minds of the other boys these records, giving them marks to try and better. At the present time we have three remarkable achievements, namely: 115 trips in one full day, averaging four and one-half minutes per trip; 50 trips on a Saturday or halfday with an average of 4.6 minutes per trip and another record of 83 trips for one full day in 4.1 minutes per trip. The one boy who holds 2 of these records was recently promoted to a clerical position in one of our office departments. All the boys realize that good work means quick promotion, and as a result, we have a ready and ever increasing response to do errands.

All boys between the ages of 15 and 18 years must first start in the errand service and from there be promoted into other positions as they arise. The boys in this way acquire a better knowledge of the product we manufacture and become acquainted with the location of every department and the name of those in charge. Also, they obtain a thorough understanding of our factory rules and regulations. In other words, this department is

(Continued on Page 51)

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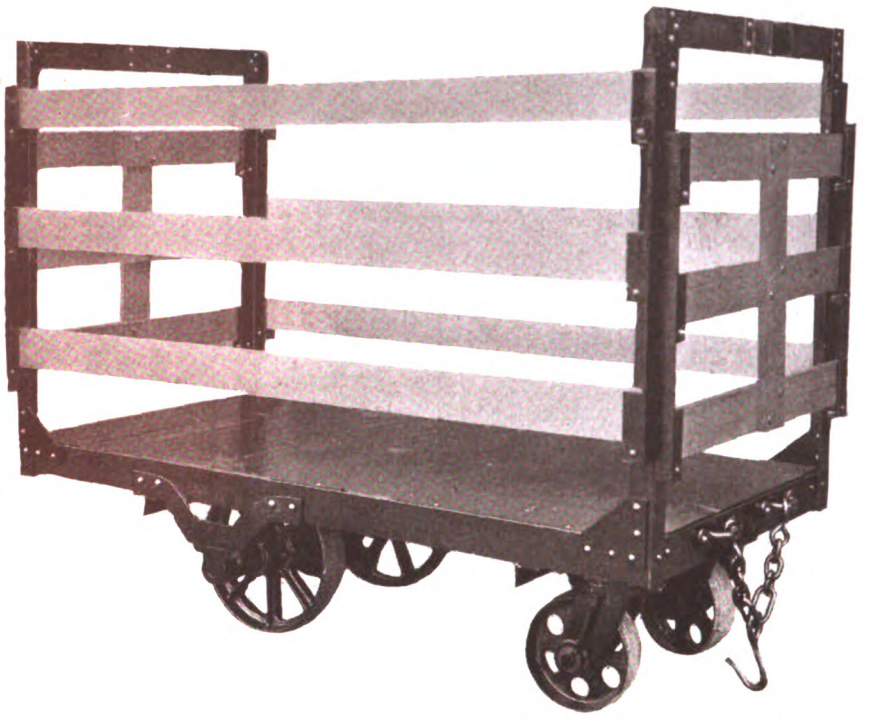


Train of "K & J" furnished the Mississippi Warrior Service

"K & J" Trailers in U. S. Government Service

View at top of page shows a large lot of trailers designed and built by the "K & J" Organization for the Mississippi Warrior Service.

This is a Government project involving a number of docks along the Mississippi. The trailers are used in handling general merchandise about these docks.



Single View of "K & J" Trailer Furnished for the Mississippi Warrior Service

These trailers were built to carry from four to five thousand pounds.

The "K & J" Organization specializes in building railless car equipment for use with industrial tractors and maintains a widely experienced corps of engineers to give advisory service in determining the types of trailers best fitted for any special conditions.

Properly designed trailers are only distant relatives of the hand truck. They will show a vast saving in service over any adaptation of a truck designed primarily for man-propulsion.

A standard line of "K & J" Trailers, ranging in capacities from one to three tons, is regularly supplied. This line comprises both the all-steel type and the wood platform type. Hyatt roller bearings are standard equipment in "K & J" Standard Trailers.

Write for Bulletin 510

Note: If, after looking at the "K & J" Standard Trailer line, you feel that a special design is necessary to meet your requirements, let our transportation experts look over your conditions. They will be able to save you money.

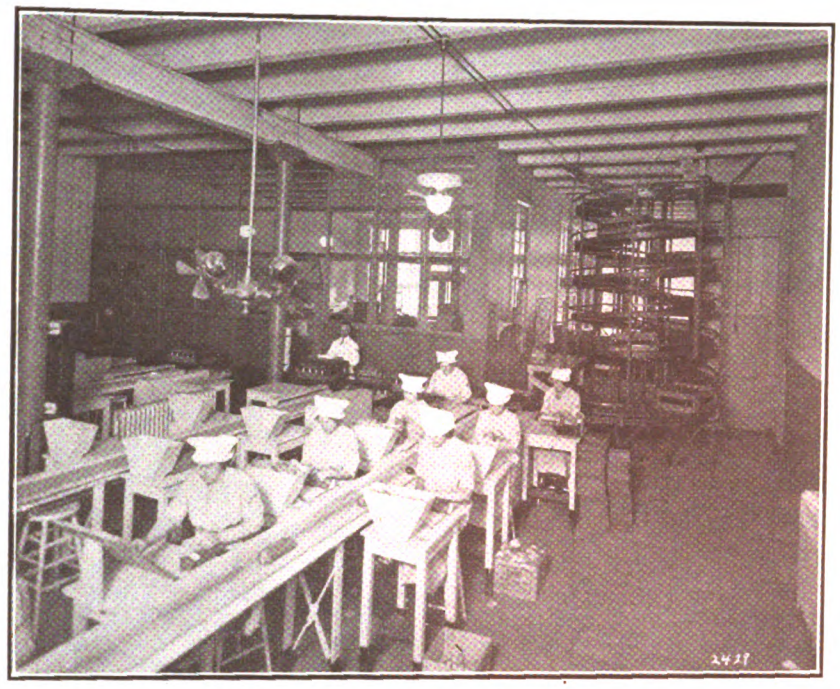
The "K & J" Organization has been Building this Class of Equipment for more than 45 Years

The Kilbourne & Jacobs Mfg. Co., Columbus, O., U. S. A.

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Saving $550 per month in dull times

Is a Real Achievement



Wrapped bottles are Conveyed by belt conveyer in foreground to the carton filling department.

The Lyko Medicine Co., Kansas City, Mo., for whom our recently installed equipment has just made this record, have this to say:

"Before installing the Mathews system, we were experiencing an endless number of delays in the various different departments of our factory, all of which have been overcome in the most satisfactory manner.

"The estimated saving by the installation of this conveyor system was approximately 24 per cent or $5000.00 in the first nine months of the operation after installing the conveyer. To say that we are satisfied is expressing it mildly.

"We would be very glad indeed to have you refer any of your prospective customers to us, and further the writer will be delighted to show them your installation here."

(Signed) A. H. Johnson, Secretary.

Empty cartons descend on upper line of conveyers and when filled are sent to shipping room on lower line.

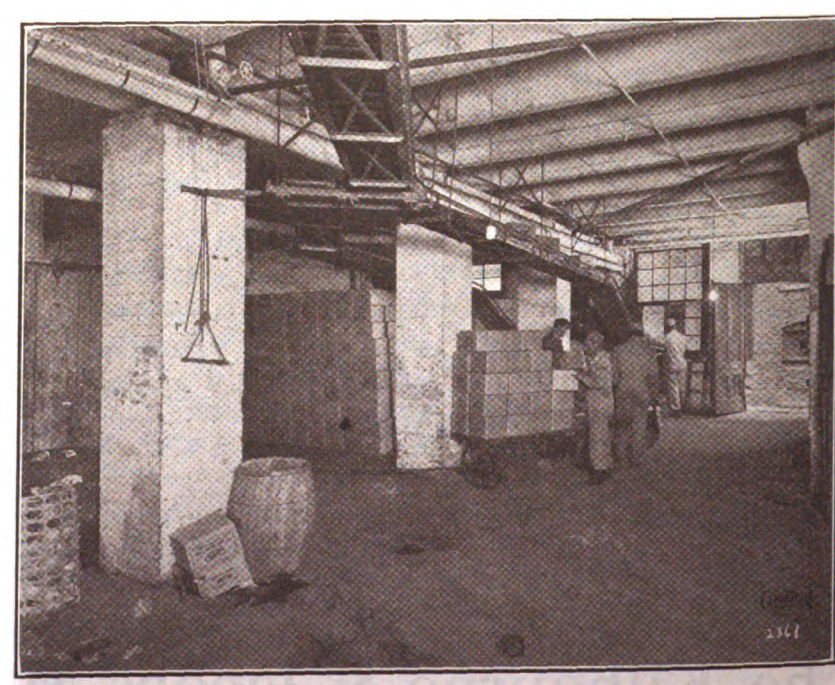


Mathews Conveyer taking cases of washed bottles to Bottling Dept.

These are days when coordination of effort and faster handling methods mean the difference between profit and loss. The day has long since passed when business will show a profit in spite of slow, wasteful hand-trucking and round-about assembling methods."

If you wish to make a worth while cut in your handling costs, by introducing rapid, direct routing methods, our nearest engineer is ready to show you how it can be done. No cost or obligation whatsoever.

Write us about the particular problem you have in mind, or ask for our illustrated catalog showing numerous dividend paying installations—today.



Discharge to shipping room has two way switch. Line at left goes to stock. Line at right loads direct to truck in alley.

MATHEWS GRAVITY CARRIER COMPANY

157 Tenth Street, ELLWOOD CITY, PENN.

MATHEWS SPEED ECONOMY GRAVITY ROLLER CONVEYER

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(Continued from Page 48)

nothing more than a school and besides accomplishing its physical duties enables the boys to collect knowledge which is an asset to them throughout their working career. This procedure gives to the boy a schooling in the essential requirements which under the old way, were drilled into him by the different foremen. This took up the foremen's valuable time and was a rather slow procedure. It can readily be seen that we now save the foremen this trouble and can easily judge the boy's qualities and eliminate all undesirables.

In order that you may better understand what is meant by a trip, the following example is herewith given: Boy reports to department calling and is sent to five different departments located in different sections of the plant. On his return he is credited with but one trip, although covering five separate errands.

As the dispatcher receives the calls he at once stamps them with a time stamp showing the time received, and if no other errands are ahead, he stamps the time the boy is dispatched. Upon the boy's return from completed errand the time is again stamped. In this way we cover the time call was received, time boy left, and the time he returned. In order that all departments may have the same standing the boys are dispatched on these trips in the same order as the calls are received, except in cases of "Rush calls," which are given immediate attention in preference to all others. No partiality can, therefore, be shown if this procedure is adhered to.

The errand slip used by this department is very simple and is provided with adequate spaces covering all necessary information. The front has to do with the time while the reverse side covers all information pertinent to the errand.

Practically all of the boys connected with the errand and mail service are members of the Bausch & Lomb Scout Troop No. 73. During the summer months they have their over-night hikes, field days and in addition to this the firm sends them to Boy Scout camp for one week and pays their expenses while there. It is needless to say that this consideration is appreciated by the boys and they, as a result, return to their duties better fit and better boys. During the winter months the boys are given access to the large assembly hall, adjacent to their club room, in which they hold their drills and entertainments.

As mentioned before all demerits carry with them a fine. These fines as collected are placed in a fund and go toward purchasing essential things in connection with the Boy Scout Troop.

In connection with the errand service, we have a large control board showing daily the standing of each boy in the bonus race. Board in question is designed to cover as many as 1242 trips in one month and at this writing it seems necessary that we make up a new board covering more miles because of the fact that on three different occasions three different boys have passed the maximum mark and up to date, we have as a record 1362 trips run by one boy in one month. This board is so made that each mile represents one trip—also, ten minutes and by using a miniature automobile and motorcycle we can accurately record the number of trips boys have made and the time consumed in making those trips. Each boy has his own automobile and motorcycle. These are easily distinguished from one another by their different numbers and colors. Going more into detail—the automobile represents or stands for the trips; while the motorcycle designates the time. For example: Taking the illustration at the bottom of page 15, which is a small section of the control board used, you will note that Number 16's motorcycle and automobile are at the 150-mile and 200-mile marks respectively. It shows that he has accomplished 200 trips in 1500 minutes; giving him an average of less than 10 minutes for each trip. On the other hand, motorcycle Number 13 is at the 200-mile mark and the auto at the 150-mile mark which shows a slow boy who is averaging more than 10 minutes per trip.

A board such as described herewith works wonders with the boys and at all times keeps them on their toes to beat the fellows who are in front, or in case of the fellow who is in the lead, to keep ahead.



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USE SILBERBERG
TIME STUDY WATCHES

All models and types of Time Study Watches, Stop Watches and Chronographs for Industrial purposes.

Send for Catalogue, data and free pamphlet entitled "Move Jobs for the Factory Stop Watch."

Approval shipments made to responsible concerns

MORTIMER J. SILBERBERG CO.
Pioneer in Manufacture and Sale of Time Study Watches

Peoples Gas Bldg. **CHICAGO, ILL.**

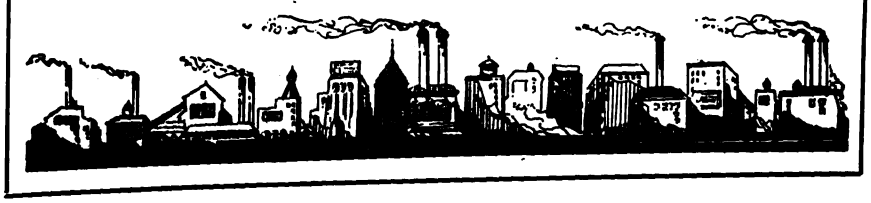
Let us Find it for You!

THE best market for a new product? Graphic methods applied to your business? The amount of power required to drill holes of a given size in various alloy steels? The best known protection against electrolytic corrosion? The effect of fatty acids in fertilizers?

Whether your query has to do with Merchandising, Engineering or Chemistry—if the information exists, either here or abroad, we will get it for you. Whether you want merely a concise abstract of all information or actual reproductions of every article ever published anywhere concerning a particular problem—our facilities and our staff of trained technical men enable us to offer you at moderate cost a prompt, comprehensive research service that has proved invaluable to scores of plants and individuals.

Booklet on request 1-4, "The Needle in the Haystack," will be sent without obligation. You will find it valuable to have on file against the time when you may need technical information of any kind.

SCHAAF RESEARCH SERVICE
15 East 40th Street *New York, N. Y.*



The Self Loading Truck

(Continued from Page 26)

In the manufacture of steel worm shafts, a progressive operation of eight steps, skids are employed to move shafts in groups of from ten to twenty-five to and from machine tools. Because of the arrangement of machines at vantage points, it is not always advisable or possible to have material travel to adjacent machines. Thus, all lathe tools, cutting machines and grinders are grouped, and material travels from operation to operation on skids. Not only is the transfer accomplished with rapidity, but a rigorous check-up of finished, semi-finished and raw stock may be readily maintained. Referring to the accompanying illustrations, it will be noted that material arranged in this manner permits the department foreman to visualize stock conditions at all times.

As the foundry is the starting point of a greater number of machine operations, electric trucks convey the bulk lots of castings to the various departments from this point. Each floor is provided with a receiving and shipping station, experience proving that a few square feet of floor space is sufficient for this purpose, and truck drivers deliver and pick up loads without attention from the department head. Transferred at this point to self-loading skids, material is arranged near machine tools in such a way that operators may secure a supply of raw stock from one skid and place finished parts on another without leaving machines. Isle markers, with rows of skids just inside, and the unbroken line of machine tools presents an appearance of orderly regularity although hundreds of workmen and tons of material are in constant motion.

In the small parts assembly departments, benches and stock are arranged so the operator may readily secure a fresh supply and place finished parts on skids without leaving his place at the bench. The general arrangement here is the same as in machine departments, and as assembly departments are located on the same floor, a skid-load of raw from its inception to final assembly.

Building storerooms are so situated that raw and finished stock may be supplied to and received from a group of departments situated in the same building. In consequence, only such material as is used by these several departments is carried by the store room; here special skid designs are studied in order to deliver in one load material for several different departments. Store room deliveries are arranged on a schedule basis, the several skids being loaded and tagged by stock men, then conveyed to and "spotted" in

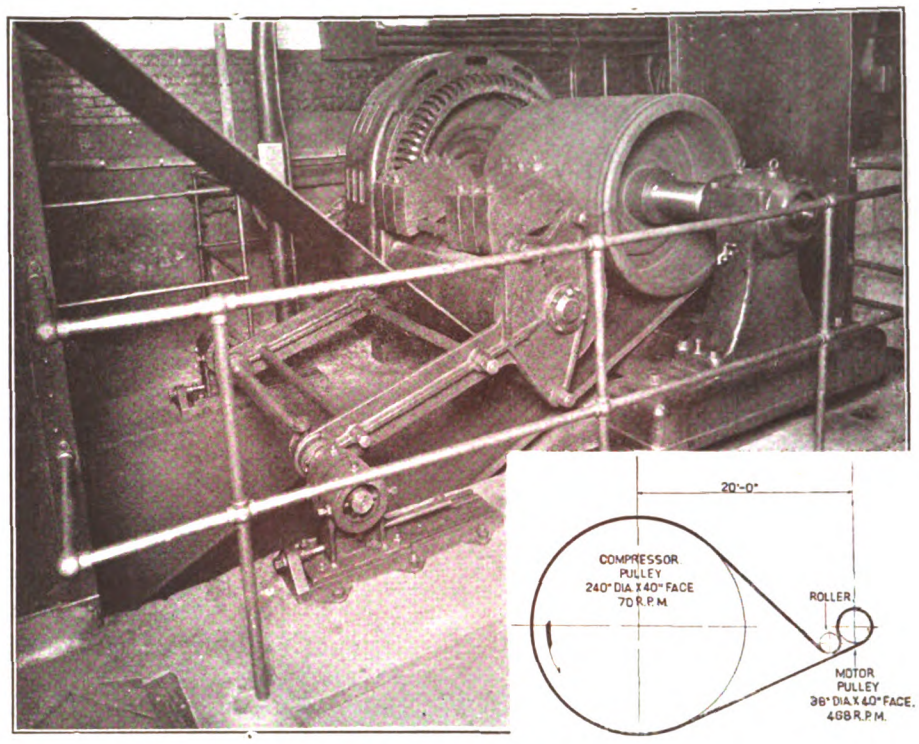
(Continued on Page 54)



Rolling logs from tractor-train into a stream, whereby they will be carried to the mill.

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Saving Slippage and Space



500 H.P. Motor Driven Ammonia Compressor
Motor Pulley 36 in. Dia., 40 in. Face, 468 R.P.M.
Compressor Pulley 240 in. Dia., 40 in. Face, 70 R.P.M
Double Leather Belt 39 in. Wide, 7/16 in. Thick.

OUR SHORT CENTER DRIVE

is wrapping this 39 in. belt around 250° of the circumferences of the driving and driven pulleys of this installation. This very large ARC OF CONTACT obtained with the KORAP*-LENIX DRIVE enables the Belt and Pulleys to transmit more power and is SAVING SLIPPAGE.

THE KORAP-LENIX DRIVE made possible the installation, on 20 ft. centers, of this 500 H.P. Compressor having a 20 ft. diameter pulley. This unusually short center distance is—SAVING SPACE.

Our booklet "Saving Slippage and Space" describes many other interesting installations of the Korap-Lenix Drive. Ask for it.

F. L. Smidth & Co.

ENGINEERS

50 Church Street **New York, N. Y.**

*Improved LENIX Drive

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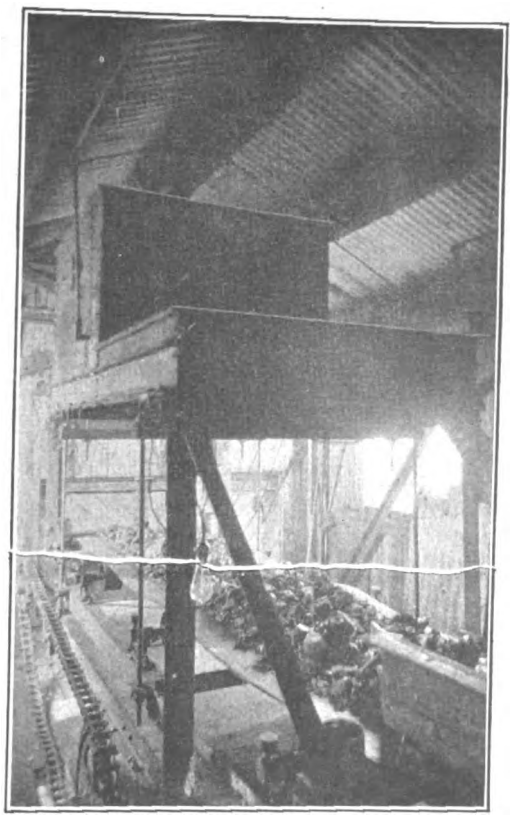
(Continued from Page 52)

the receiving space in departments by the store room laborer. As the raw stock is consumed, the department laborer moves the loaded skids from the receiving station to machines, and piles the empties at the shipping station, eventually returning same to the store room. The use of small pans for bulk lots of screws, bolts, washers, etc., box skids for small castings, and the careful arrangement of supplies on skids, cuts delivery time and trips, simplifies handling in departments and results in keeping breakage expense at a very low figure.

As all departments are provided with a schedule time table of bulk delivery and shipment of finished parts, the foremen arrange their inter-department collections to meet this arrangement. Special orders for rush delivery are phoned to the transportation dispatcher's office; truck drivers are notified by a tele-call system; an entry is made on the daily dispatch sheet of time, truck, material and destination; and a check placed against the truck until the driver notifies the dispatcher of the delivery. The two systems have been found to work in perfect harmony. Moreover, by maintaining a rigorous check on varying conditions, the transportation system is kept flexible to the extent of promptly meeting any unpremeditated fluctuating of routine conditions of manufacture.

The problem of internal transportation has always been a complex one for any industry to solve. Only by the application of scientific methods can this most important part of modern production be made efficient. The passing of the old methods of hand trucks, manually loaded, sometimes with the help of overhead cranes and countless laborers, in favor of the progressive and scientific system of centrally dispatched, self-propelled and self-loading trucks, has not only made increased production possible but has shown a very definite and large actual saving in cost of our internal transportation.

WEIGH IT IN TRANSIT
THE MERRICK WAY



Typical Installation Merrick Conveyor Weightometer

THE MERRICK CONVEYOR WEIGHTOMETER

weighs any material while in transit over a belt, bucket, or pan conveyor, without interrupting the flow and needs no attendant or weighman.

Your Conveyor is not complete without a Merrick Conveyor Weightometer

THE WEIGHTOMETER will automatically record in any unit required—the actual weight of material with a guaranteed

ACCURACY OF 99%

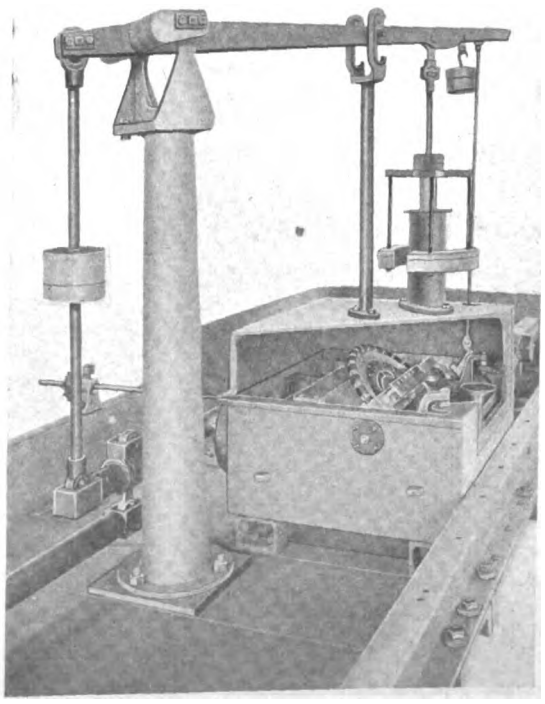
Some of the many commodities handled
Coal
Coke
Ores
Cement
Clinker
Sand
Gravel
Stone
Fish
Fertilizer
Concentrates
Sulphite Laps.
Etc. Etc.

Check up your coal or other raw or finished material.

Tell us your weighing problems.

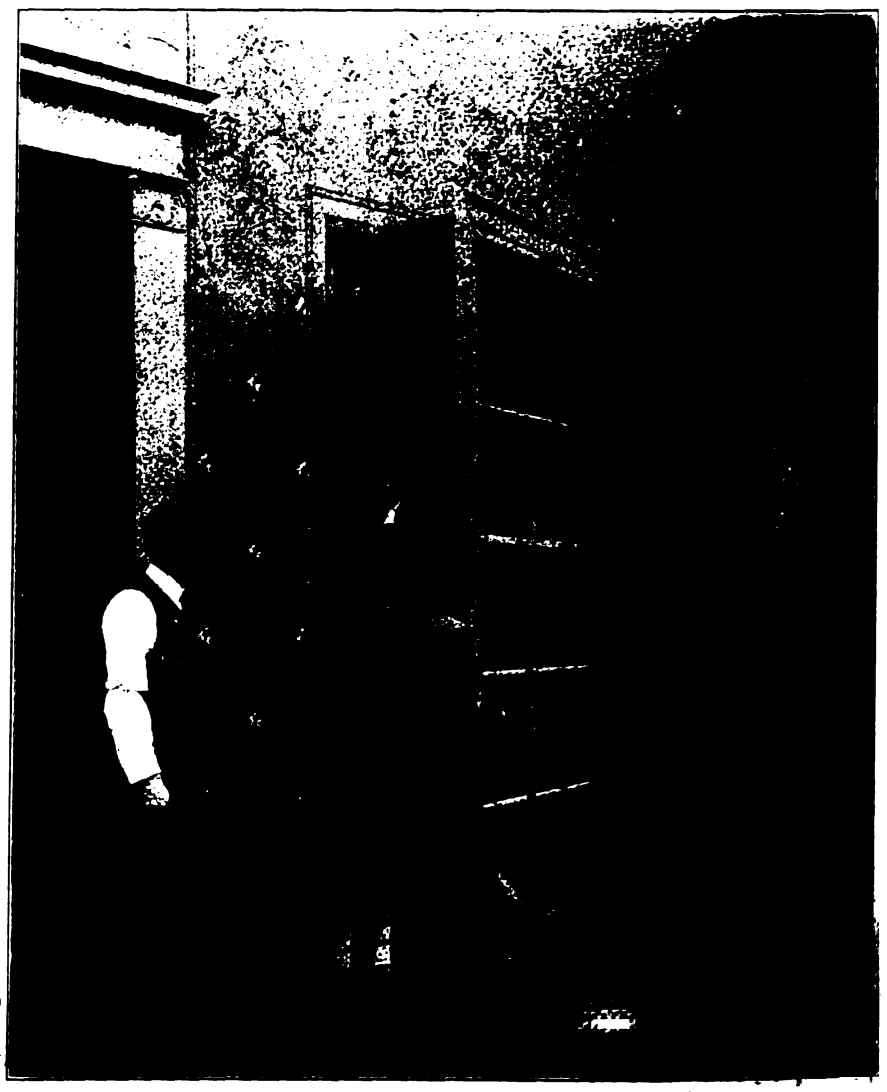
We can save one or two men.

Eliminate all delay and give accurate records.



Showing weigh beam standard, fulcrum bracket with weigh beam: also integrator box with part of the cover cut away to show details of construction.

MERRICK SCALE MFG. COMPANY
186 Autumn Street, Passaic, New Jersey



This shows the substantial nature of some of the modern motion picture stage settings.

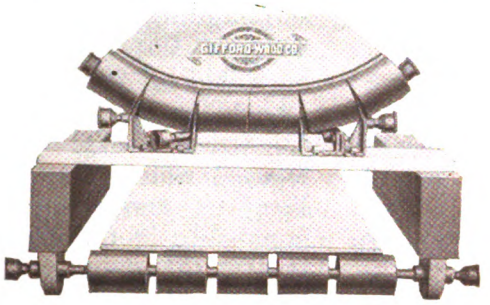
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COAL HANDLING MACHINERY



Pivoted Bucket Carrier

A combination machine, handling both coal and ashes. Extensively used in large power plants, where high class equipment is essential.



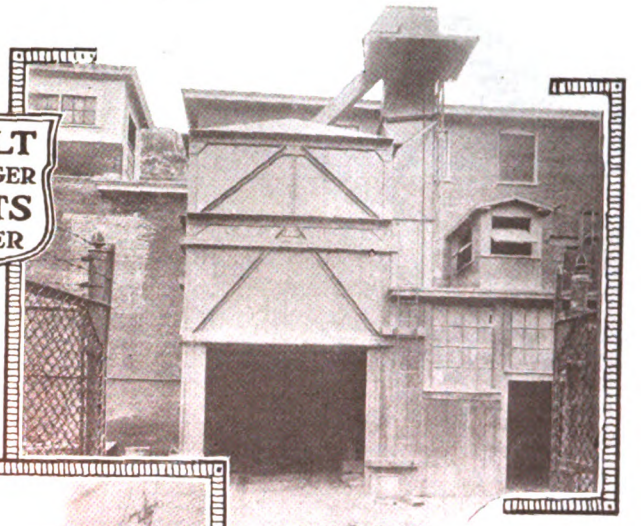
Belt Conveyor

The most economical type of horizontal conveyor. Will operate at any angle up to 20° from the horizontal.

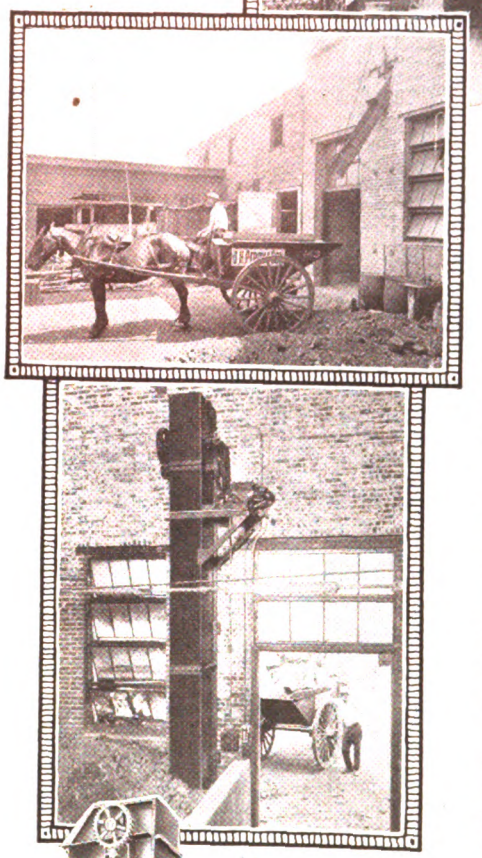


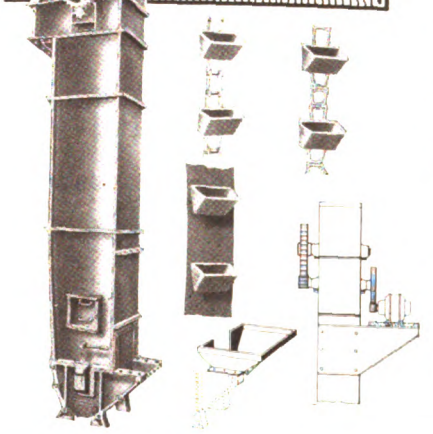
Apron Conveyor

Made to handle, at slow speeds, all classes of material at any desired capacity.



Gifford-Wood "Standard" Centrifugal Discharge Elevators used for handling ashes





Ashes and Coal—G-W and True Economy

Just three things your power plant must do with its coal, aren't there: Handle it quickly, burn it effectively, get rid of the ashes cheaply?

That's true of your plant, as of others, even though design and arrangement may vary. The "problem," so called, remains the same—and its solution, oftimes, too.

For many years Gifford-Wood has been building equipment for getting coal to the grate and getting ashes to the wagon, truck, car or barge—quickly, efficiently, cheaply.

Standardized machinery has been evolved that fits into almost every type of plant; economical in price, installed at small cost, inexpensive to operate.

There is hardly a coal-using power plant that cannot utilize our regular "in stock" equipment. We can always meet the exception—but the utmost in economy with requisite reliability is achieved when you can use "G-W Standard."

G-W Products

The Gifford-Wood Company specializes in elevating and conveying machinery for all lines of industry. These products include coal crushers, pockets, screens, elevators, conveyors, hoppers, locomotive coaling stations, elevating and conveying equipment for ashes, stone, sand, gravel; wagon loaders, pivoted bucket carriers, warehouse conveyors, car unloaders, friction clutches, hoists.

108 Years of Progress

2116-R

Main Office: Second Hill, Hudson, N. Y. **Branches:** New York Chicago Boston Buffalo

Gifford-Wood Co.

MATERIAL-HANDLING-EQUIPMENT

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Our Merchant Marine

(*Continued from Page 10*)

asked Frank Seymour Hastings, whose knowledge of matters nautical arises from both an inborn love of the sea and a varied practical experience.

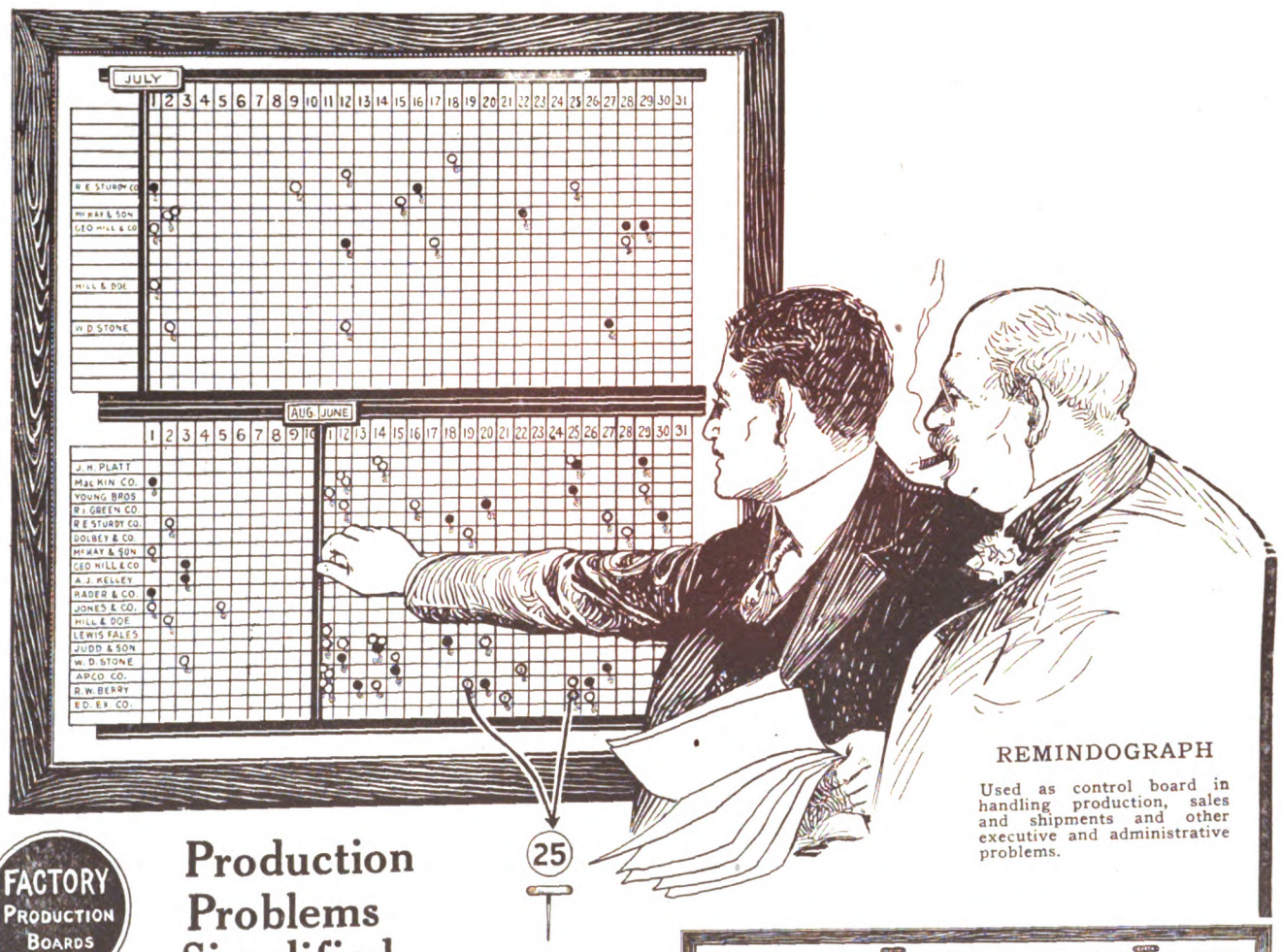
"Your question," said Mr. Hastings, "calls to mind an incident which may be pertinent. Some years ago I was bound home from England on the "*Deutschland,*" and going down on the tender from Southampton, met the late Andrew Carnegie, whom I knew very well. He asked whether I was acquainted with the captain of the "*Deutschland.*" It so happened that I counted Captain Albers among my best friends in command on the North Atlantic.

"As soon as the tender had put her passengers on board, Captain Albers sent for me to come up to his room and asked who there was of prominence among the passengers, whom he ought to know. When I mentioned Mr. Carnegie's name, he said at once: 'That is a man I want to meet.'

"When we 'got clear,' the Captain invited me to bring Mr. Carnegie up to his room, and the shipbuilding question was discussed in all its phases during daily interviews on that trip. Mr. Carnegie, of course, had an expert knowledge of shipbuilding in this country, whereas Captain Albers had been laid off for one year, engaged in superintending the construction of the "*Deutchland,*" which was then the largest, finest and fastest steamship in the world.

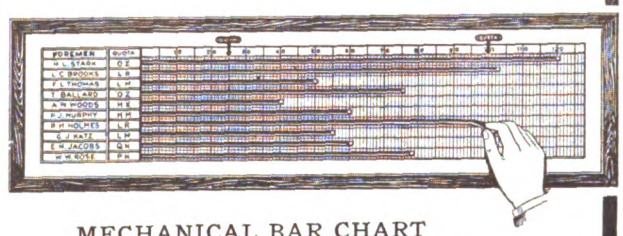
"Early in the voyage Mr. Carnegie made a remark to the effect that in his judgment in the near future all the greatest ships in the world would be built on the Delaware. To Captain Albers, this was like the proverbial shaking of a red rag at a bull. He admitted that our material was, perhaps, as good and nearly as cheap, but he argued that our high cost of labor in America would make it impossible for us to compete with the cheap labor on the other side of the Atlantic. To this Mr. Carnegie's answer was that our comparative high cost of labor was offset by our wonderful system of labor-saving devices."

Under normal conditions it has been proved time and again that this statement of Mr. Carnegie's holds true in many industries, and there is every reason to believe that it would hold equally true of shipbuilding. In fact it is generally admitted that a slight modification of our war-time method of producing ships would enable builders in this country to overcome the comparatively high labor costs. Under the stress of urgent need, the building of our emergency fleet involved wastes due to haste and to the vicious "cost plus" system. In normal times, then, there must be some other explanation of our failure to undertake the building of ships commensurate with our standing as a na-



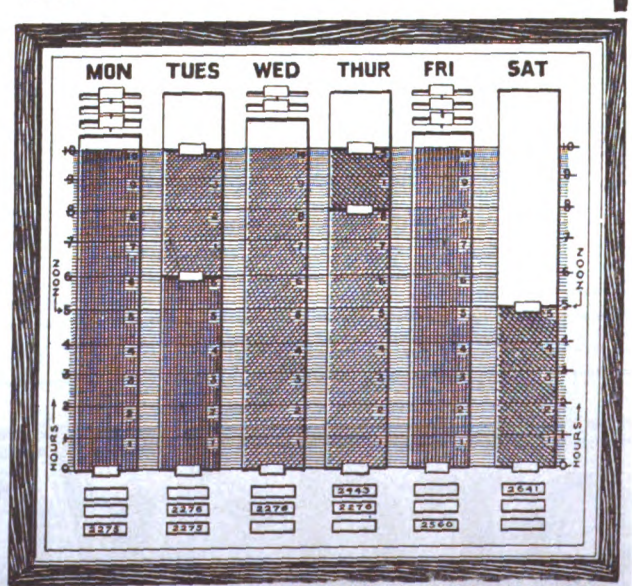
REMINDOGRAPH

Used as control board in handling production, sales and shipments and other executive and administrative problems.



MECHANICAL BAR CHART

for making quickly each day graphic comparison of work accomplished by individuals, gangs or departments.



COMPOSITE MECHANICAL BAR CHART

showing condition or quantity of stock on hand, or for assigning work to machines or departments.

FACTORY PRODUCTION BOARDS

ROUTING and DATING SALESMEN

WATCHING CREDITS and COLLECTIONS

PLACING SPEAKERS and EXHIBITS

KEEPING DELIVERY PROMISES

PROGRESS ON ORDERS IN WORK

CLOSING and DISCOUNT DATES

DAILY COMPARISON RECORDS

FLUCTUATIONS OF STOCK ON HAND

Production Problems Simplified

through EDEXCO

MECHANICAL GRAPHS

On these simple types of Control Boards your work is charted before you by the week or by the month and through numbered or colored glass pins you have a complete and accurate check on its every phase.

Edexco Mechanical Graphs will handle any business problem — Manufacturing — Selling — Administrative; yet are so simple that any clerk can operate them. With a chart of the type best suited to your business, it is possible for one individual to keep track of many shifting units on a board a few inches square, combining the advantages of easily-made changes and complete visualization for future work.

Write us your problem. We will recommend a plan to fit your individual needs. Free booklet giving price and details of Mechanical Graphs on request.

Educational Exhibition Co.
427 Custom House St.
Providence, R. I.

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tion. In answer to a question, Mr. Hastings spoke of a factor that had not previously occurred to us:

"It has been currently rumored," he said, "and I believe it to be true, that the '*Mauretania*' and '*Lusitania,*' two of the greatest ships in the world, were built with money supplied by the British Government at the low rate of 2½% per annum interest. Why is it that such a liberal policy cannot be secured from our Congress? The reason is obvious. A large majority of our Congressmen are from the interior, away from the seaboard, and they know little and care still less about shipping or foreign trade. The average middle western or southern Congressman would incur the displeasure of his constituents if he favored our shipping interests of which his constituents have little or no knowledge.

"Aside from the question of cost of building, the fundamental question is the one of policy on the part of the government toward the shipping and shipbuilding interests. We have seen how, in time of war, England's liberal policy in this respect paid more than dividends; for it was her immense merchant fleet that saved her in spite of the submarine. What many people fail to see, however, is that this liberal encouragement—even to the extent of subsidies such as Great Britain grants—is not merely a measure of war insurance. That is but one factor. As a matter of fact, the nation without an adequate merchant marine is handicapped at every turn, in the struggle for world commerce.

"And in world commerce—trade with other nations in all parts of the globe—lies the hope of a revival of business in this country on a scale commensurate with our resources.

Forestry and the Paper Industry

(Continued from Page 14)

wood forests of the eastern portion of the continent.

The paper industry in the United States, however, has in the last few years, shown a notable trend toward the south. Southern woods are being used instead of spruce, and the promise for the future is great, with the development of methods of pulping the wood which has previously been unsuitable for paper through lack of knowledge as to reduction methods. Southern pine, rapid growing as it is, offers a future, when the time comes, as it certainly will through scientific investigation, when the resin and other undesirable materials can be eliminated.

This in a broad way is an outline of the relation of the paper industry to forestry which led to the introduction of legislation in Congress to protect the existing forests, and to replant the cut over lands, a movement in which the paper industry is officially represented by one of the forestry committee of the American Paper and Pulp Association as chairman of the National Forestry Program Committee, which is sponsoring this legislation, and one of its salaried men as the unpaid secretary of this committee. It is one reason also why this organization a few years ago selected as its secretary not a paper manufacturer, but a technical forester and economist.

The getting out of pulp wood involves the establishment of elaborate forestry operations, the locating of roads and trails, and the building of dams to control the streams in which when possible the pulp wood logs are transported to the mills.

Woods operations formerly were largely confined to the winter months, in order to cheapen transportation of the logs from the dense timber tracts over ice roads to the banks of the streams into which they are tumbled to go down with the spring freshets. Winter is still the best time for such operations, but some work is done in the summer with the logs piled for winter transport, or hauled out by tractors, which are rapidly taking the place of the horse in hauling logs, owing to the lower cost of power hauling.



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It is a fascinating trip, worthy the pen of Stuart Edward White, or such writers on the out-of-doors, to go into the timber and come down with the "drive" in the spring. In many cases it is a week's trip by canoe from civilization to the woods operations, and a longer trip back, coming down stream with the drive.

In the woods will be camps for the woodsmen, no longer camps populated by men alone, but often providing homes for their families. From these camps the men go out in pairs to fell the trees, trim them of branches, and then comes the trip down river of the log in twelve or sixteen foot lengths. Where the timber is close to the mill, the wood is sometimes cut into the four foot lengths in which it is handled by the pulp mill machinery.

A log jam is a striking scene to the novice, but a menace to the worker. The use of tools to loosen the key logs which have blocked the flood of logs or the dynamiting of the logs when they may be jammed at a waterfall, may mean death to the river-man. In such a case one paper mill company lost two river-men, and a motion picture operator barely escaped with his life after taking a notable picture of the drive.

When the pulp wood has been cut into short lengths at the pulp mill, it is tumbled in barkers which remove the bark, and then the wood is subjected to conversion into pulp by one of two main methods, chemical or mechanical. Both chemical and mechanical pulp is used in most papers, one for the fibre and the other for the filler, to use non-technical terms.

The wood in the mechanical process goes into grinders where the wood is pulped by pressure against grind-stones, and then is screened and put over machines which convert it into thick sheets or laps for storage until needed in the paper mill.

In the sulphite process, the wood is cooked in digesters with sulphite liquor, which is prepared in the mill by burning sulphur, for preparation of the sulphurous acid, in combination with other chemicals as necessary.

Before being cooked, it has to be chipped into small pieces to give the reducing chemical agents opportunity to act on the wood. The sulphite pulp is pressed and lapped in a general way as is done with the mechanical pulp.

When the paper making process is reached, this pulp once more goes back into fluid form, by its mixture and beating with great quantities of water. The proportion in which it goes into the machine is about 99½ per cent water to ½ per cent of solid, but the mechanical process of drawing the water from the solution is a most elaborate system. The paper machine is from 200 to 300 feet in length, and in the beginning the pulpy fluid flows over a closely woven mesh of wires, through which the water is drawn, leaving a film of wet pulp.

From the Fourdrinier wires, named for the builder of the first machine under this process, this film of pulp, the beginning of paper, goes between rolls where the sheet is formed, the rolls being called the couch rolls, a French word used to indicate that here the paper is born.

From these rolls the paper goes to endless belts of felt through press rolls, and thence to the dryers, where, by being passed over large heated drums, the remainder of the water is removed.

For fine papers a special coating bath and new drying is added to this process, and calender rolls under high pressure put the finish on the sheet.

Processes vary widely according to the grade of paper being manufactured, but this in brief, is the process which is used for the production not only of newspapers, but of the "book" upon which America's books and magazines are printed. The book paper is a refined product of the paper machine, which in its general lines is used for the production of all grades of paper from the thinnest tissue to the box board used for paper boxes.

In the fine writing and similar papers, rags are used, with the same general process as already described.

But back of the publication of this or any of America's great magazines lies the forest, the spruce, balsam, hemlock of the north, the poplar, cottonwood, gum of the middle states, and the yellow pine of the south.

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Here are the five big elements—the five fundamental divisions of business; (1) *Organization;* (2) *Methods and facilities;* (3) *Cost and Cost Finding;* (4) *Statistics;* (5) *Policies.*

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America's Industrial Cornerstone

(*Continued from Page 16*)

If any business firm attempted to operate its business along the lines that Congress has applied to the Patent Office, it would soon have no business of any kind left. The men who have stood loyally by the Patent Office in their continuous connection with it through the recurrent vicissitudes of Congressional neglect deserve all praise, for "standing by the Ship," though constantly aware that they are subjected to injustices under which they would never be placed in ordinary business.

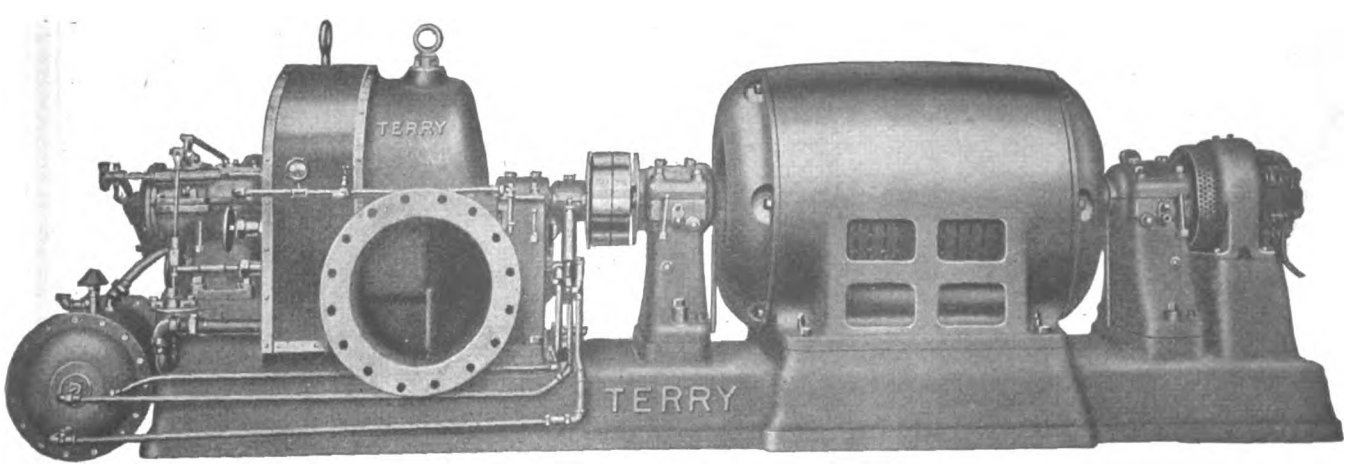
The new recruits are not worth much without years of office training. Who must do this training: the examiners who remain fatihfully at their post and are thus obliged to take valuable time from their respective duties to become instructors in what amounts to a patent attorneys' training school? Not alone is their time and ability taken away from the duties for which the government receives the applicant's fees, but at the end of the training period the "student" is likely to resign because of the non-alluring pay of $1500.00 the office can offer and step into a position with an industrial concern at double pay. Thus it is established that the government is receiving funds for which an inadequate return is being made.

If the members of Congress could be made to realize their responsibilities in this matter to their constituency, industry at large and the remnant of faithful members of the Office Staff—Congress would be ashamed to do nothing, or so little, but would rise to the occasion and properly expand the staff at commensurate compensation, and enlarge the facilities of a department that is just as important and deserves as liberal or better treatment than the Bureau of Standards which has been properly provided with an adequate staff and equipment.

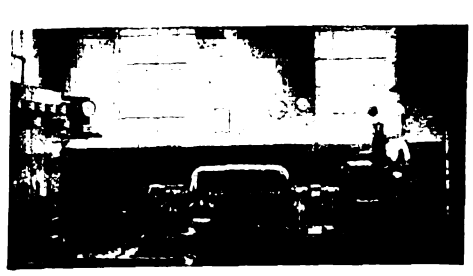
The Patent Office from 1837 to 1862 inclusive—25 years—has had but eight years in which the disbursements have exceeded the receipts— 1837, 1840, 1841, 1853, 1854, 1856, 1857 and 1862; since which time, excepting one or two years, a surplus has been earned. This surplus for 1921 was $71,745.73 which is included in the surplus of $8,376,769.29 that has accumulated in eighty-five years. This amount legitimately earned is withheld from the Patent Office for its proper development for reasons which would result in the separation of a business manager from his connection, yet Congress assumes to paternally look after its interests by withholding from the office its own funds and niggardly providing for its continuity.

The Lampert bill, tardily remedial no doubt, still penalizes the country's industries to the extent of increasing the first government fees $5.00 on each application filed; which industry has already earned in cumulative surpluses. And Congress refuses to repay the Patent Office this money which has been used in other directions, and compels the Patent Office

(*Continued on Page 62*)



Large Units for the Small Plant



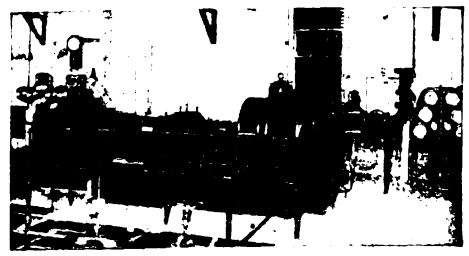
The main unit for the small plant is not a miniature large unit nor an overgrown small unit but represents a distinct class with its own separate development.

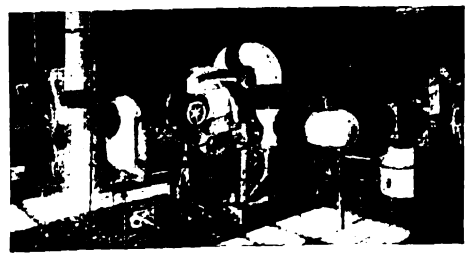
The Terry condensing turbine is designed for just this class of service with capacities ranging up to 1500 H.P.

The Terry line includes straight high pressure condensing for small central stations, low pressure, mixed pressure and bleeder units which are more applicable to industrial plants which have heat as a by-product or require heat for commercial process.

Their principal advantages are small space and light foundations with the attendant saving in plant construction and cost, simplicity of construction with its attendant freedom from repair and little attention required, high efficiency even at partial loads, adaptability to high pressures and superheats which, of course, means added efficiency.







Permit us to explain these features and give you further reasons why you should specify

THE TERRY TURBINE

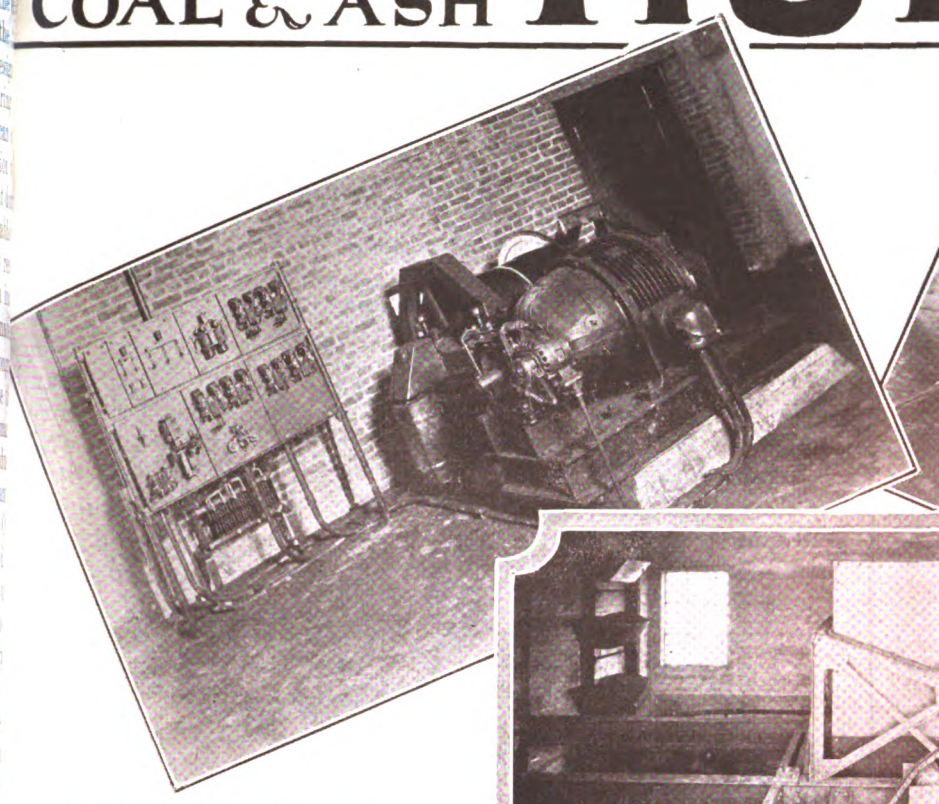
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Terry Sq. Hartford, Conn. U.S.A.

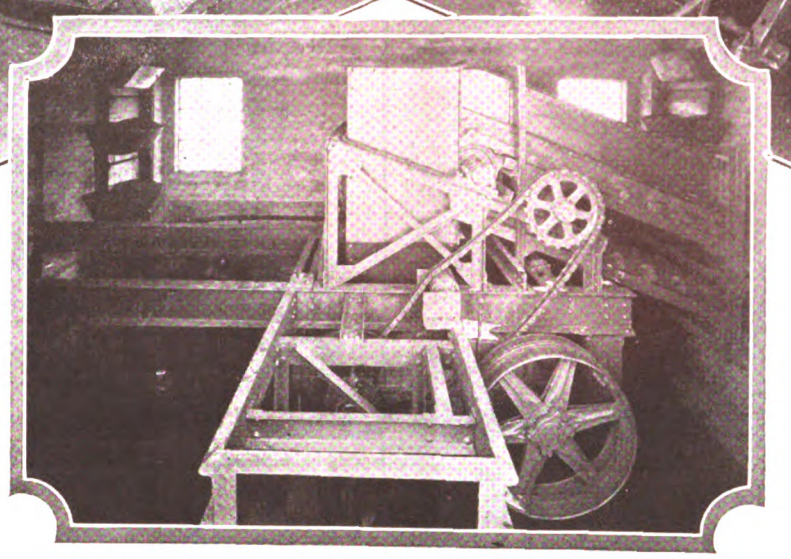
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Control Panel and Hoisting Machinery for Skip Hoist



Apron Conveyor Feeding Coal into Coal Cracker



Double Run of Conveyor over Coal Bunker

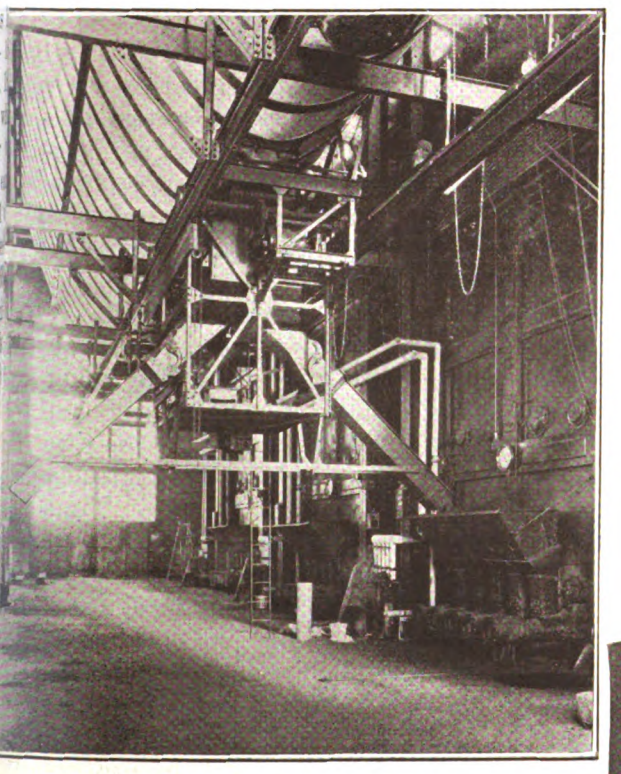
Cutting Down Power Costs

EVERY item of labor involved in getting coal from the cars to your grates, and in removing the ashes after combustion, is just that much added to your power costs.

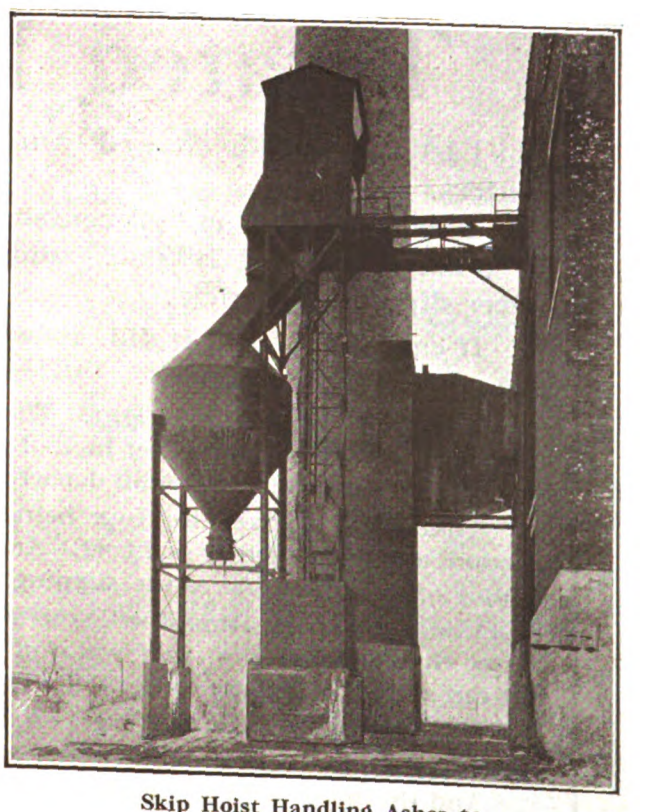
The photographs grouped on this page show a complete coal and ash handling equipment which we recently installed at the Utica State Hospital.

The installation shown effects a great saving in the handling of coal and ashes.

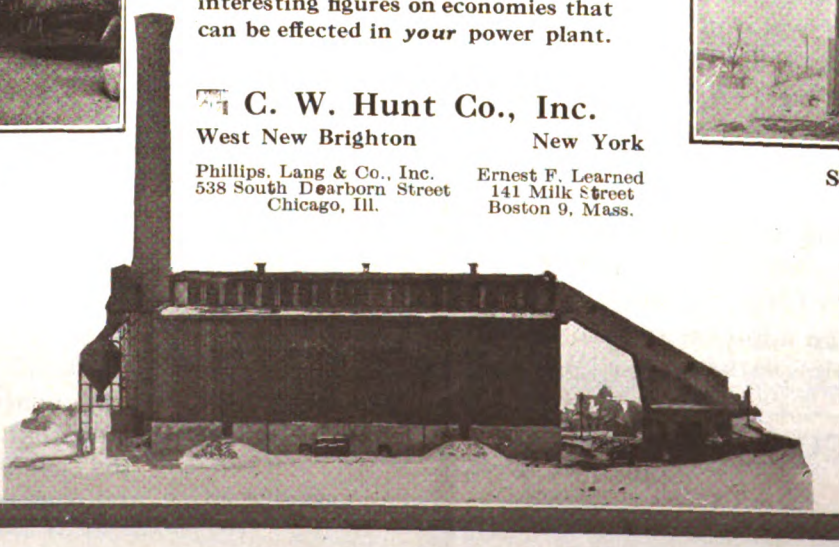
Our engineers are prepared to submit interesting figures on economies that can be effected in *your* power plant.



Electrically Operated Traveling Weigh Larry



Skip Hoist Handling Ashes to Storage Tank



General View of Utica State Hospital Power Plant

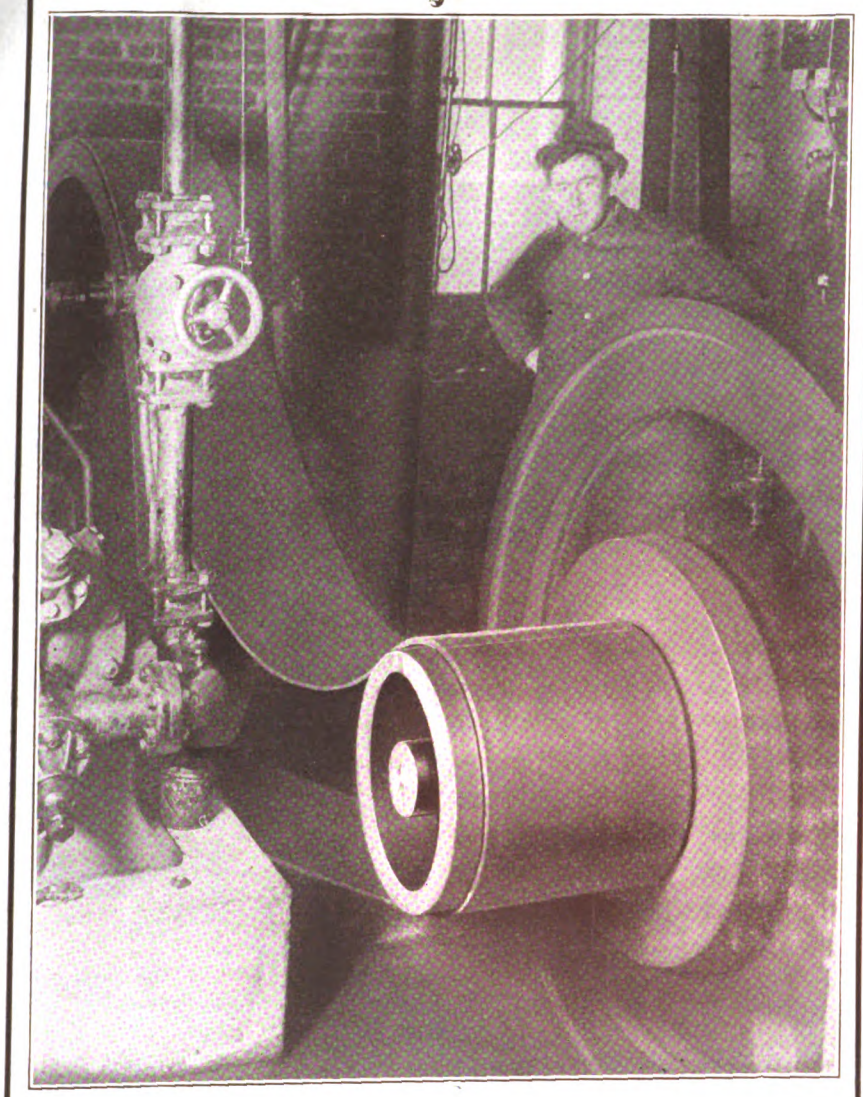
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That strain is stretching your belts, producing excess friction, and eating power and coal. And what good is it? Simply to stop the worst of the slipping.

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Cling-Surface Company

1052 Niagara Street Buffalo New York

(Continued from Page 60)

staff and its friends to beg for a return of that which Congress has had no right to have appropriated to other purposes. It is humiliating to be put onto the basis of a mendicant when only pleading for the return of one's own.

It is in fact a misuse of trust funds, this appropriating yearly surpluses to different purposes than that for which they were paid. The expert services in the Patent Office are entitled to as much compensation as those of experts in any other line. The inaction of Congress may have been due to a lack of information, yet the hearings held by the Committees on Patents have been phenomenally attended by representatives of the largest industries and the foremost scientific societies of the country, yet notwithstanding this unanimous approval, "the powers that be" cause the whole industrial system to totter on the verge of intense ruthless piracy.

Injured industries that have piled up surpluses are ask for fair play. What conc would strangle a business t for more than half a centu had earned a net annual s plus on all receipts which Patent Office, a going conce has actually been doing? eighty-five years the total come including 1921 to Ju 30th has been $81,053,652.00 average over $953,000.00 year, during which time the nual surplus has averaged, even numbers $98,550.00, su ly a respectable increment a yearly turn over less than times greater than the surpl

What about the future? W the friends of the Patent Off and Congress have necessa vision to plan liberally, dec vigorously and execute broa for the benefit of our ever panding industries? If crit ism has been pointed, let a c structive plan be adopted th will raise the Patent System a plane of greatness which should inherently occupy. T aspirations must be hi enough to reach a definite go

The Present Trend in Engineering Education

(Continued from Page 17)

before the colleges is where to draw the line between the older and the newer methods of doing things. Should blacksmithing be pushed aside by the drop hammer and the acetylene torch and the electric welder? Why teach reciprocating steam engines and pumps to men who may operate nothing but steam turbines or electrically driven machinery? Why make a man plod along with an engine lathe when his output will be the product of a turret-lathe or a thread-miller? Why teach him to write when a typewriter will do it better with less labor? Why waste time on multiplication or addition when a slide-rule and an adding machine are far better? These are some of the elementary problems before the engineering educator today.

It has been discovered that more lines than one lead to professional success, that the old courses in railroad surveying, steam engineering, dynamos and quantitative analysis can be abridged; and that the applications of the calculus, heat, electricity, and chemistry can be found and used t training just as effectively highway engineering as in ra road work, in automobile a gas engineering as in ste engineering, in telephone gineering and wireless tel raphy as in dynamo desi and in metallography as blow-pipe analysis.

More emphasis is being p now upon concentration of st jects. Fewer subjects and le widely scattered ones is t rule today. Specialization increasing rapidly. Time w when civil engineering was t only branch of engineeri practiced outside of the arm Now we have dozens branches of each of the maj divisions of the professio Most of the colleges ha ceased to give the professio degree on the completion four years of college work, a leave the professional degr to be earned by successful a plication of theory to practi The demand is growing for fi and six-year courses, followi the leads of the American Me ical Association and the B Association. The graduate e

(Continued on Page 64)

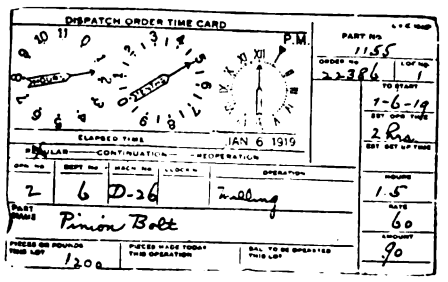
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Cheaper because they LAST!

(*Continued from Page 62*)

gineer today must be a more highly educated man than was his father, and four years is not time enough in engineering any more than it is in other learned professions, all of which require six or seven years of education after graduation from a first class high school. The present trend is to make greater use of the summer quarters for study, shop experience, and engineering practice before graduation, as such work should lead to a more thoroughly digested course of study in college. The aim of the students should be to study their subjects so that they will understand and be able to use them afterwards, rather than as a means to the end of getting a certain number of credits for graduation.

The demand of both the alumni and the faculty is for a more thorough grasp by the student of the fundamental subjects. Unfortunately there are differences of opinion as to what is meant by fundamentals. Each man seems to mean either the subject which is most difficult for him or the one in which he is then most interested, or else the basic sciences of his branch of the profession. Faculties are being urged to increase the time devoted to the basic subjects such as mathematics, physics, chemistry, logic, English language, public speaking, psychology, and economics. Unless a man has a firm grasp of the underlying principles of the profession, he may be a dangerous man unless continuously checked. There is an increasing demand for a broad basic education on which can be built a strong and tall superstructure of engineering practice, hence the increasing practice of taking an Arts curriculum before taking the one in engineering. It is claimed by some employers that 90% of the alumni are deficient in their knowledge of fundamentals and that the colleges have pumped into their students too many facts which remained undigested, and too much quantity and too little quality; and yet these same employers ask that additional subjects be taught so as better to fit the young man for their employ.

Most members of faculties are heeding these criticisms and are trying to adjust their subjects and their teaching to the times. Where the proper perspective and teaching could not be secured for the subject, engineering colleges have been forced to create departments of engineering mathematics, engineering physics, engineering English, and the like. Completed courses that are valueless for any practical use do not commend themselves to practicing engineers. The necessity for a working knowledge of English, both spoken and oral, including public speaking, should be self-evident. The lawyer has the advantage of the engineer because he is trained to express his thoughts orally, and not solely in written or graphic language, and his fee is directly proportional to his ability to convince his hearers by his argumentation. The same should be true of the professional engineer.

Most colleges aim to educate the average man and not give special attention to either the subnormal or yet the brilliant student. An interesting experimental study has just been begun in the education and training of the selected few, and under the leadership of a successful practicing engineer, at Antioch College, Yellow Springs, Ohio.

When all is said and done, we do not want the man from college to be able to prove that he is only a book-worm and not human. For this reason, efforts are being made to add some idealistic and social virtues to the student's other acquirements, and fraternities, clubs, associations, and college activities of different kinds are used to humanize and civilize the student of one idea. He should be trained as to personality, to be able to talk to, mix with, and learn from other men. Nor is it sufficient that he should do every thing possible for his own advancement, as he should learn to be a good citizen by studying human relations and human engineering, that most difficult branch of the profession, and to find out by happy experience that he who gives most gets most.

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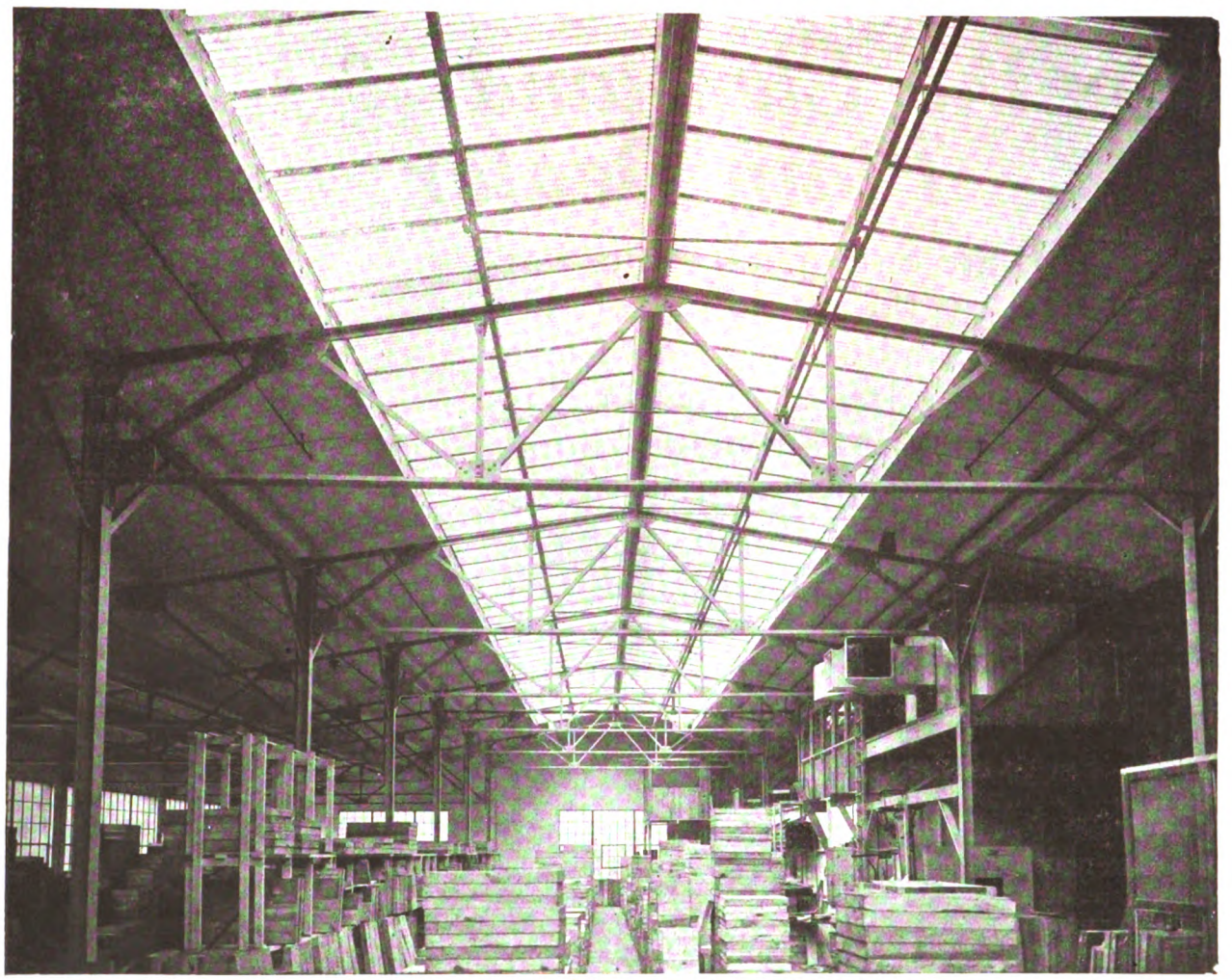
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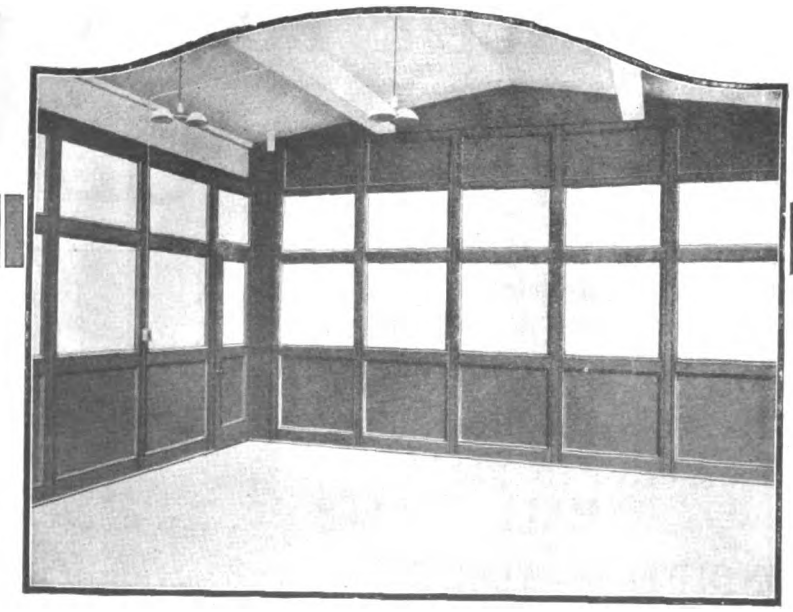
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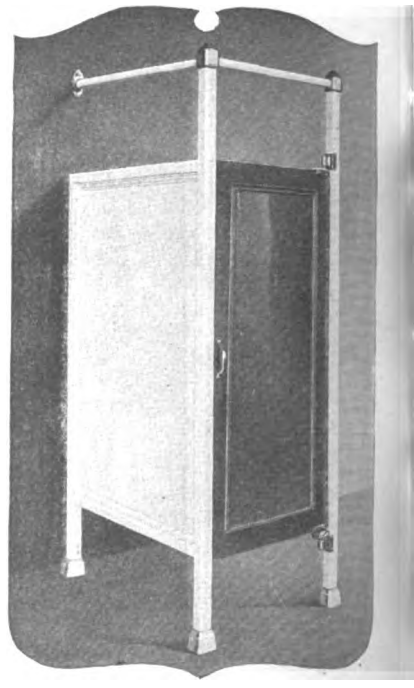
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Sanymetal Partitions are made in two types: the one illustrated above for offices exclusively; and a somewhat simpler design, at a saving in cost, for factories and factory offices. They are all built in unit sections, which assemble faultlessly and rigidly. They are finished the same inside and outside. Glass is set in strip rubber and stopped in by our improved drawn steel mold—no bolts or screws. All fastenings are skillfully concealed, also, by molds, so that the installation has all the clean-cut and finished appearance of the finest wood cabinet work. You will be interested in the *first* catalog ever published on metal office and factory partitions exclusively. It's Sanymetal catalog No. 4—a line from you will put it on your desk.

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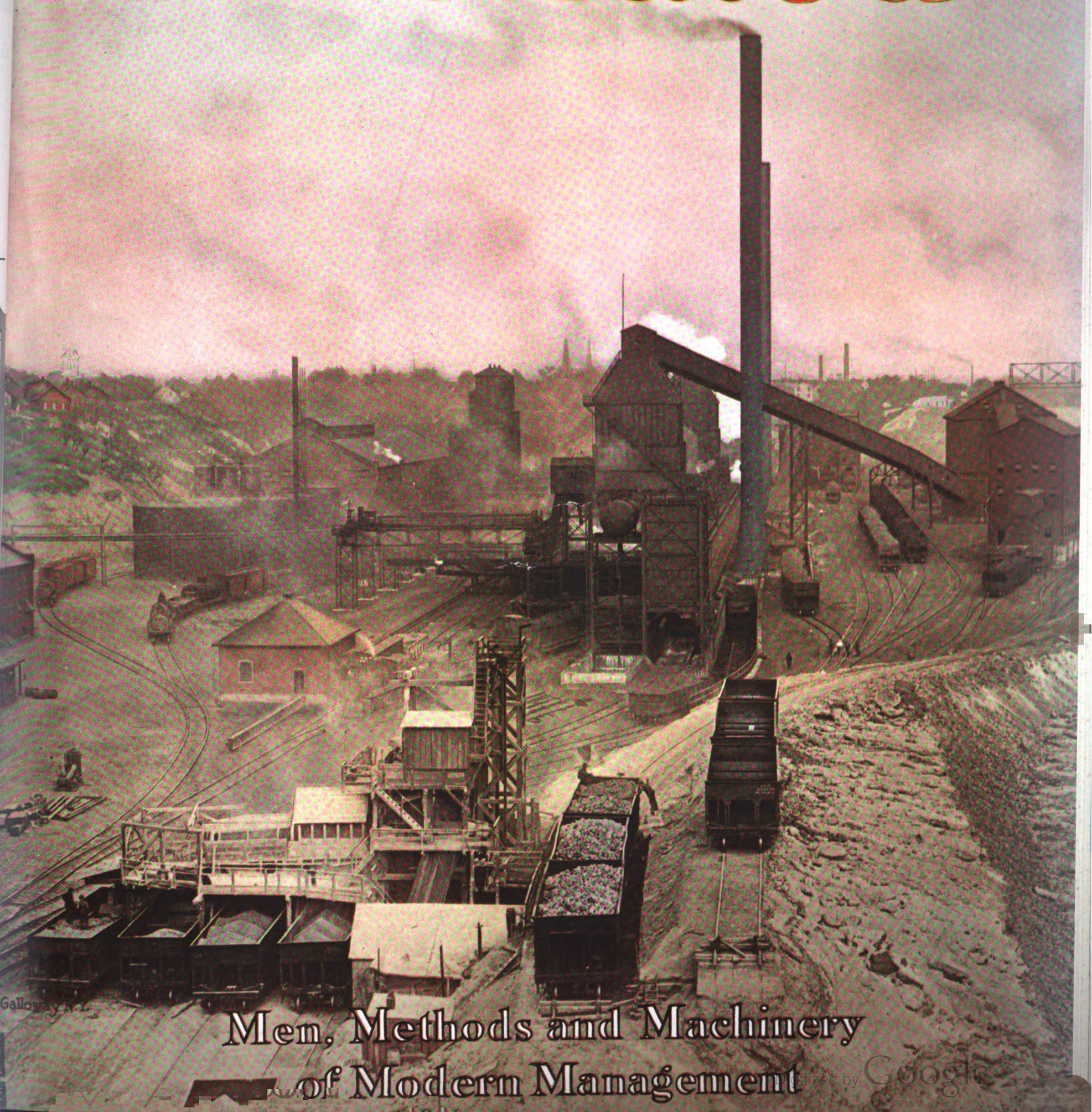
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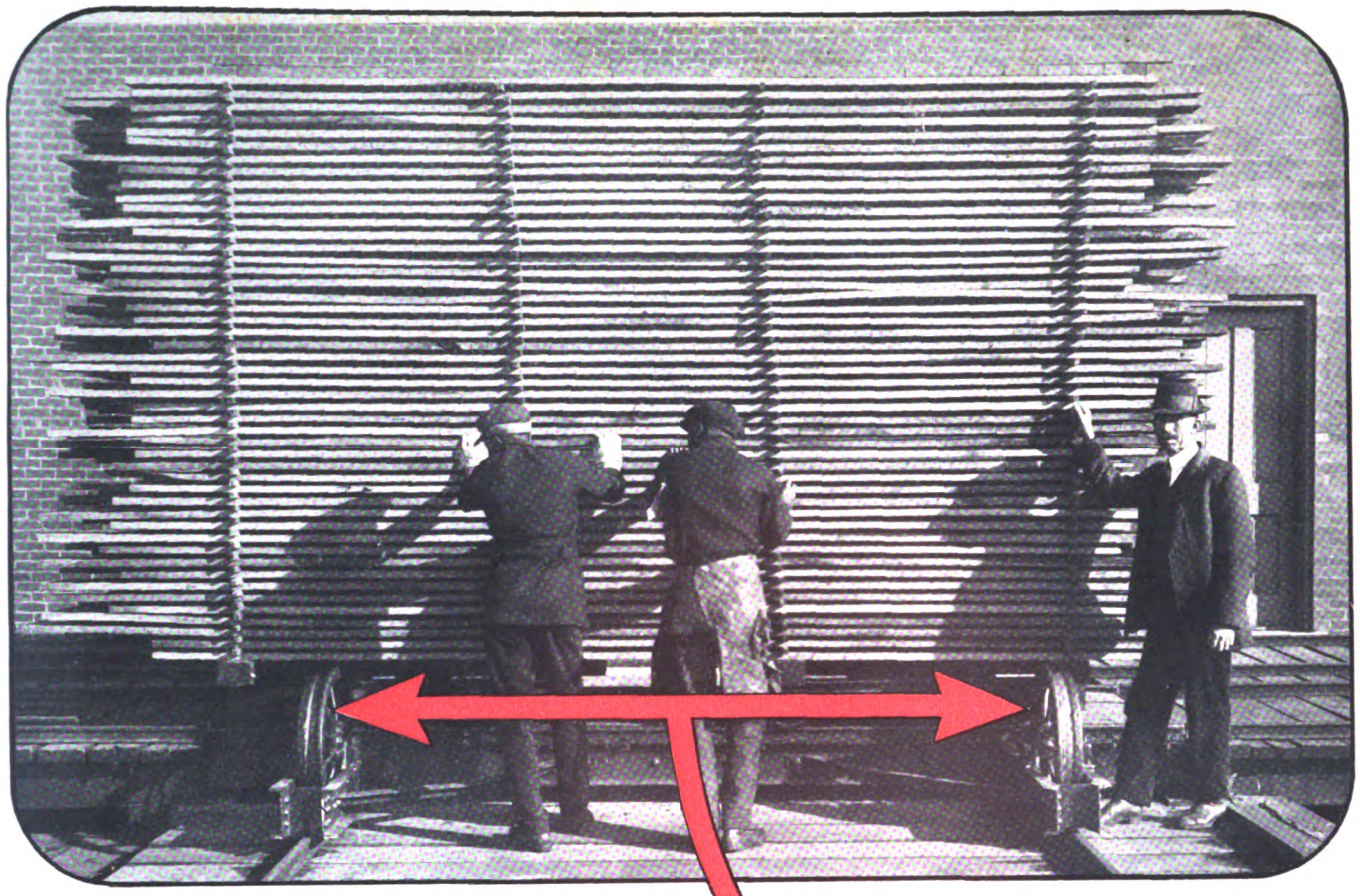
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Industry Illustrated



Men, Methods and Machinery of Modern Management

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Hyatt Bearings Retain Their Youth While Wheels Grow Old In Service

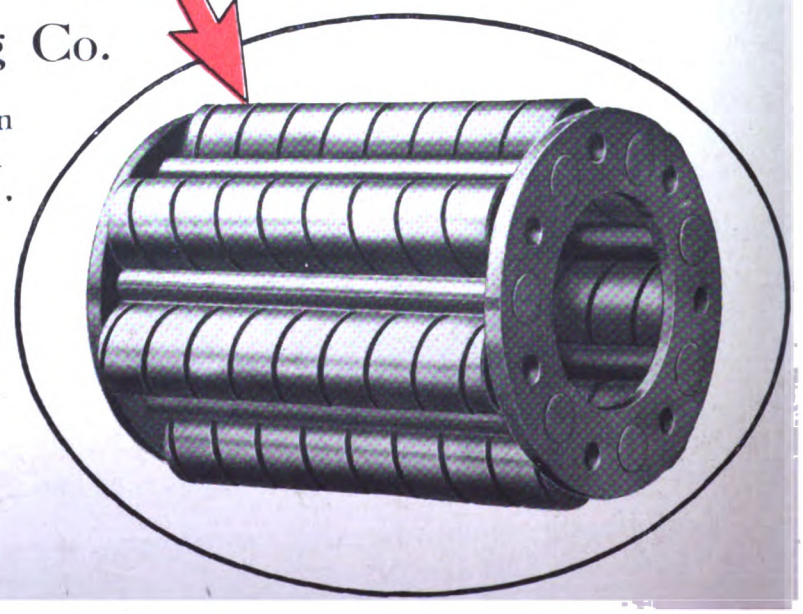
For twenty years 19 of these transfer cars at the Globe Wernicke plant have been carrying their 7½ ton loads of hard wood.

The continuous handling of these heavy loads has completely worn out one set of wheels for these cars and deep grooves show in the treads of the present wheels, but—

The Hyatt roller bearings that started to make these cars run easily in 1902 are still in perfect condition today—they have outlasted two sets of wheels and are seemingly good for many years more.

This durability is a typical Hyatt record and shows why Hyatt roller bearings are essential parts of economical cars and trucks.

Considering the many years of easy running, lubricant saving service without maintenance costs that you can secure by the use of Hyatt bearings, can you longer afford to operate plain bearing equipment?



Hyatt Roller Bearing Co.

Industrial Bearing Division

New York, N. Y.

Motor Bearings Division, Detroit
Tractor Bearings Division, Chicago
Pacific Coast Division, San Francisco

USE HYATT BEARINGS ON YOUR LINE SHAFTS TOO
BULLETIN 125

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Industry Illustrated

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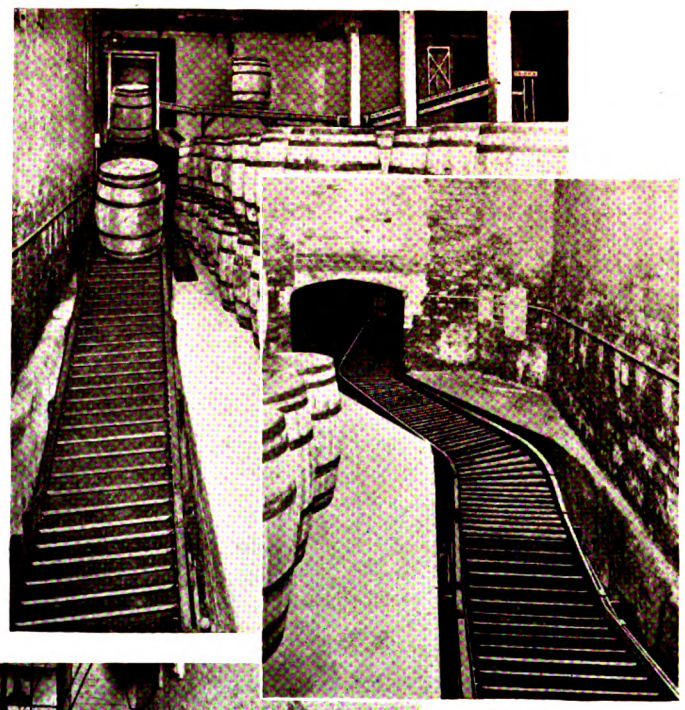
or $13,000 Yearly Saving in Cash

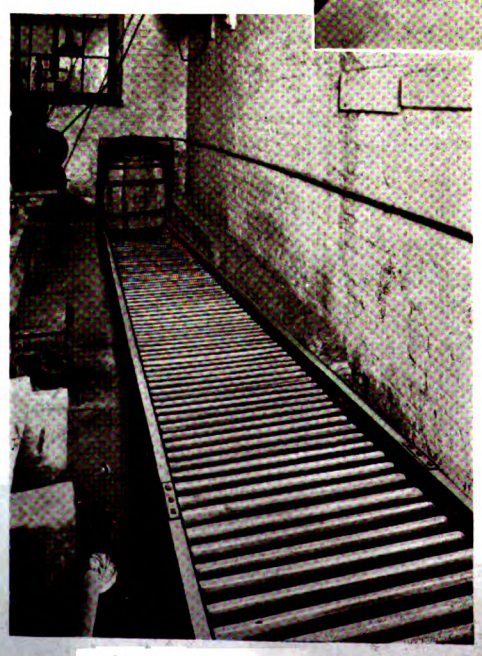
Remember, this is a *yearly* saving---on an investment of less than half that amount.

Furthermore, with ordinary use, the equipment will yield this dividend for many years. When such savings are possible with the

MATHEWS
SPEED ECONOMY
GRAVITY ROLLER CONVEYER

how can you afford to cling to obsolete merchandise handling methods?---costly lug-and-truck methods which keep your production costs high, deprive you of profits and prevent more rapid business growth.





Three views of the Mathews Conveying System which is Saving the Ryan Cooperage Co., Chicago, Ill., $13,000 yearly. The system consists of gravity roller and power driven pallet conveyers.

"We Now do in 30 Minutes, What Formerly Required 1¼ Hours"

Says President of Prominent Cooperage Concern

Speaking of the equipment shown in the accompanying illustration, Mr. C. M. Ryan, President of the Ryan Cooperage Co., says:

"This equipment has been in use just a year—and it has not been necessary for us to spend one penny for maintenance.

"We are handling on the Mathews Gravity Carrier 18,000 barrels daily, and can handle in a half hour what formerly required an hour and a quarter."

"Before installing the equipment, it was necessary to use four teams at $10 a day each or at a yearly cost of $12,000 which the Mathews now saves us."

This is the testimony of only one corporation of many thousands we have served.

Our nearest engineer is ready to work out a plan for applying modern handling methods to your business without obligation.

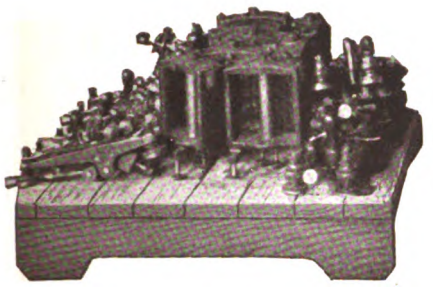
Write us to have him call, or ask for illustrated catalog showing numerous installations in nationally known factories.

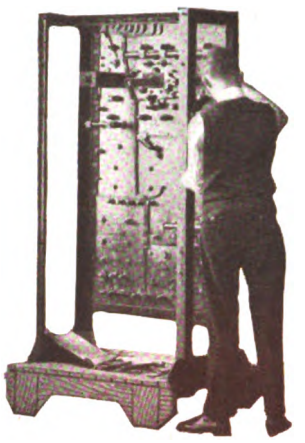
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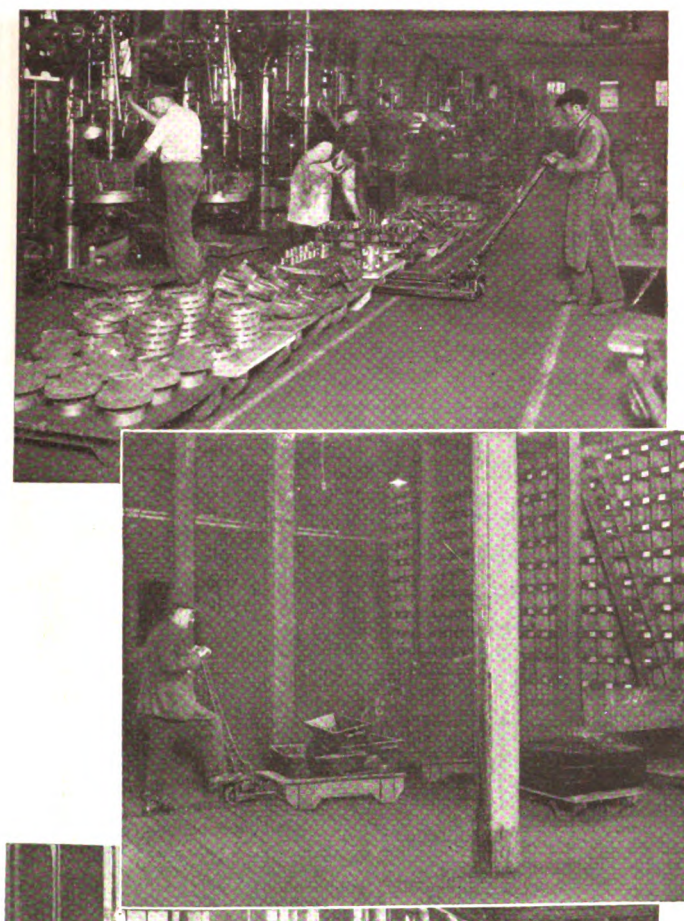
SKID YOUR LOADS—CUT OUT REHANDLING

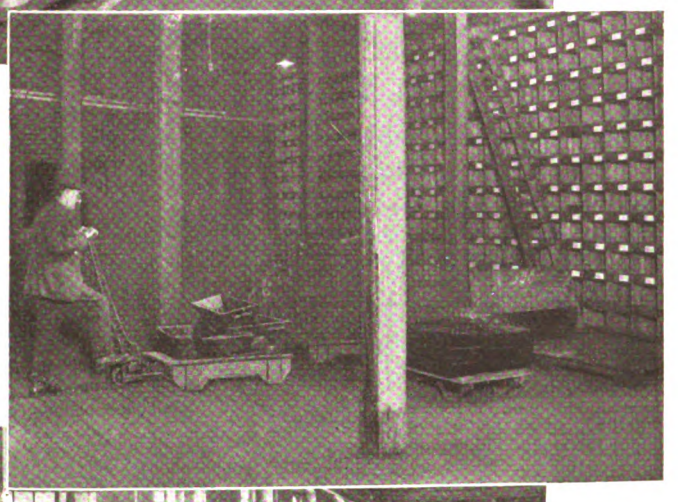
Photographs secured through courtesy of the Otis Elevator Company, Yonkers, New York.













Economy—Clear Through From Foundry To Shipping Platform

Thirty to forty hours of exacting workmanship—through three departments, from assembly to shipping platform—but electric switchboard controllers are kept on the same skids; and no rehandling.

Clear through eight progressive steps of steel worm shaft manufacture—but no rehandling of casting loads.

These are just two glimpses of the many dollars of material handling economy effected in the five-city-block plant of the Otis Elevator Company, Yonkers, N. Y. From foundry to shipping platform—practically no loading, unloading, and reloading, stacking and restacking, with their waste in time and labor.

COWAN Hand Lift Trucks

—twenty-six of them—and hundreds of inexpensive skids are used for inter-department and short distance haulage. No capital tied up in, no expensive maintenance of, costly platform trucks. Material weighing hundreds of pounds picked up, moved, and put down by one man. Production speeded, turnover increased, time and labor saved, maintenance and equipment cost greatly reduced—wasteful expense turned into profit.

No matter what your loads may be—castings, packages, bales, boxes—compact, bulky, awkward—there's a "Through Ticket" way to more profit with Cowan Skids and Hand Lift Trucks. A Cowan representative will gladly give you complete information. Or do you want a Cowan Bulletin first?

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THE MOST ECONOMICAL
RETURN LINE VACUUM HEATING PUMP
JENNINGS HYTOR

This new addition to our well known line of Jennings Vacuum Heating Pumps has ample capacity for 4,000 square feet of equivalent direct radiation.

Because of simplified design, in connection with quantity production, this unit is being sold at a price never before possible in a pump of this capacity.

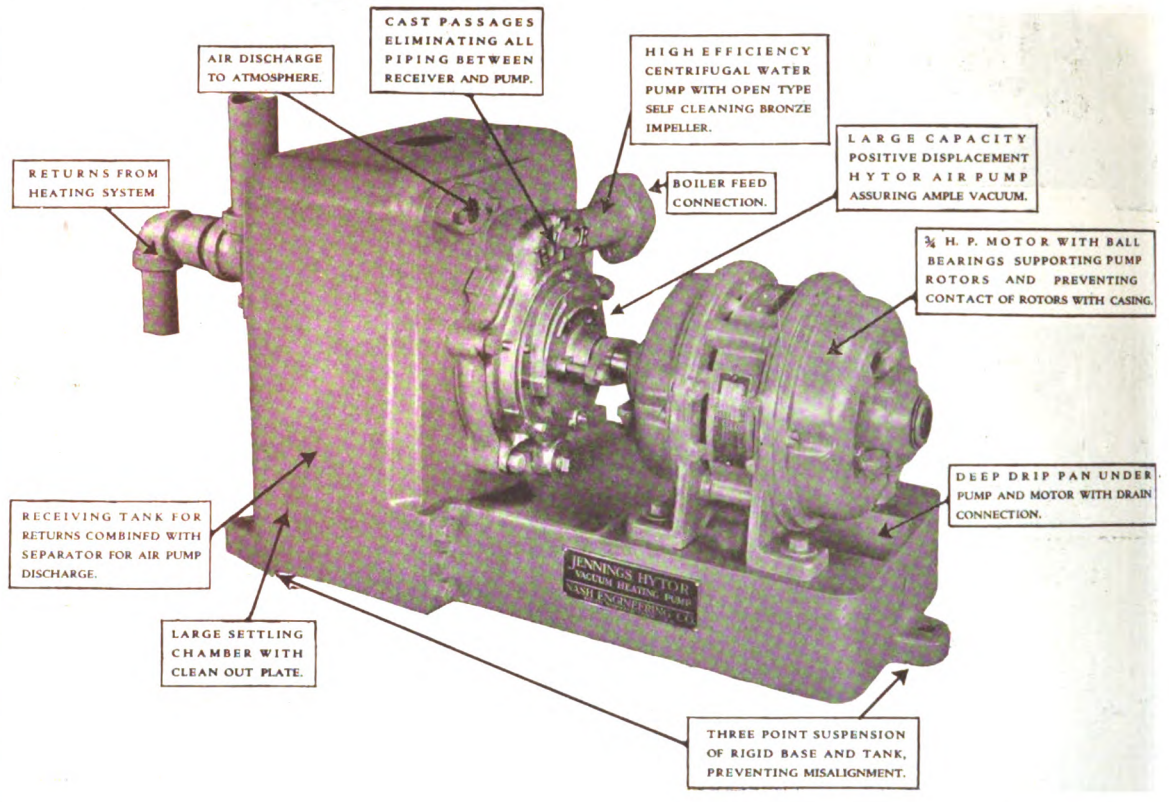
The pump incorporates all of the high grade workmanship and material characteristic of our Jennings equipment. It is equipped with solid bronze air rotor, rotor housing, water impeller and shaft.

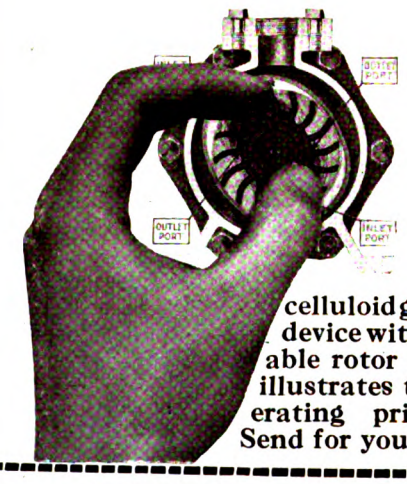
In this unit all piping complications have been removed, and it is only necessary to make three connections:

1. The return main,
2. The water discharge,
3. The air discharge.

The air capacity is 3 cubic feet per minute, measured at 10" of mercury vacuum. The pump at the same time handles 6 gallons of water per minute from a vacuum of 10" of mercury against 10 lbs. gauge pressure at the pump. Under these conditions the pump requires ¾ h. p. motor.

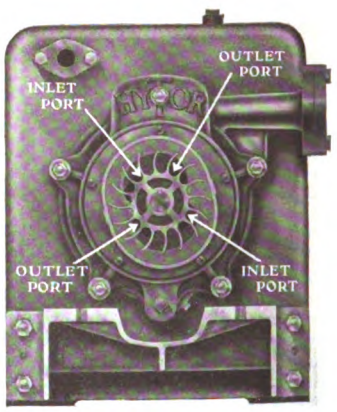
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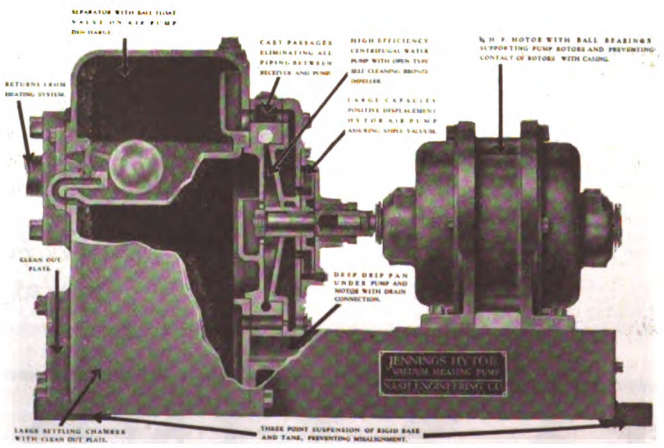




This celluloid graphic device with movable rotor clearly illustrates the operating principle. Send for your copy.

In this pump a positive displacement vacuum pump with high efficiency exhausts air only, while a centrifugal pump element handles only the condensate. In thus separately handling air and water in a predetermined ratio, such high efficiency is effected that no other pump can be secured of equal capacity for similar service with the same minimum horse power requirements.





While the new compact "M" type is furnished in one size, our well known Jennings Pumps in separate tank design, as recommended for larger capacities, are furnished for any size installation.

Many thousands of these pumps have been installed and have given universal satisfaction.

An important feature of these pumps is the very large air volume, as compared with their capacity rating, which assures ample vacuum.

As the horse power required is considerably less than for any other pump in the market of the same *rating*, regardless of the actual *volume*, the result is very low electric current cost. This, coupled with the extreme durability of these units, make them the most economical return line heating pump it is possible to install.

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Industry Illustrated

John H. Van Deventer, Editor

W. Thomson Lees, Associate

Reginald Gordon, Associate

EDITORIAL

What Are We Waiting For?

TOO many of us have been grimly hanging on, waiting for "things to get back to normal." And this applies alike to the manufacturer and the merchant, to capitalist and to laborer.

What *is* a normal condition of business? Is it one where orders rain down like ripe plums, where price is immaterial so long as goods can be obtained; as in the years immediately preceding our entry into the war? Of what value is executive ability, or ingenuity, or good merchandising, or salesmanship—under such conditions?

Ask any ten men what they thought of the year 1921, as a business year, and at least nine out of the ten will say it was bad. Nineteen-twenty was all right; but nineteen-twenty-one——!

And yet—in 1921—the F. W. Woolworth Company's sales were $147,654,-647; an *increase* of more than six million dollars over 1920.

In 1921, the J. C. Penney Company's sales were $46,641,928; an *increase* of almost four million dollars over 1920.

In 1921, the common stock of the American Stores Company *earned* dividends of $13.89 a share, as compared to $12.79 a share in 1920.

Is there something about the chain store idea that keeps men from bowing their heads to a business depression and makes them find a way not only to keep going, but to increase their business?

But no; whatever the "something" may be, it is not confined to the chain stores. Not to weary you with too many figures, we will cite but one more case: that of the Gillette Safety Razor Company. This company, judging from its earnings, had not been told about the "boom" period and the subsequent depression. The Gillette Company's earnings, in 1918, were $5,252,136; in 1919, $6,025,-350; in 1920, $6,803,407. and in 1921, (the "bad" year) $7,008,564.

We do not for a moment contend that business was "normal" in 1921. In fact, business in general had probably reached a lower ebb than at any time in the previous dozen years. And yet, in almost every industry there have been one or more concerns which not only held their own, but increased both their sales and their net profits during the bad year of 1921.

Business as a whole is still very far from normal. There are encouraging signs here and there; there is evidence of an upward trend. So much for business as it is. But what about the *conditions for doing business?*

The family budget, the merchant's budget, the manufacturer's budget, today—all embrace not only income receivable, but a long list of things which must be bought to make up for the long period when buying was at a standstill. And the criterion by which every dollar of these budgets is controlled is *value*: that each dollar spent shall render one hundred cents' worth of value.

Are these "abnormal" conditions for doing business? If so, then the longer they last the better it will be for industry and for the country; the better it will be for the real executive, who knows his job and succeeds because of that knowledge; the better it will be for the real salesman, whose ability to sell will be valued at its true worth; the better it will be for the rank and file of real workers, whose honest dollar for dollar standard of work will drive out the slackers.

Additional copies of this Editorial will be furnish[illegible] on request

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The Aladdin's Lamp of Science

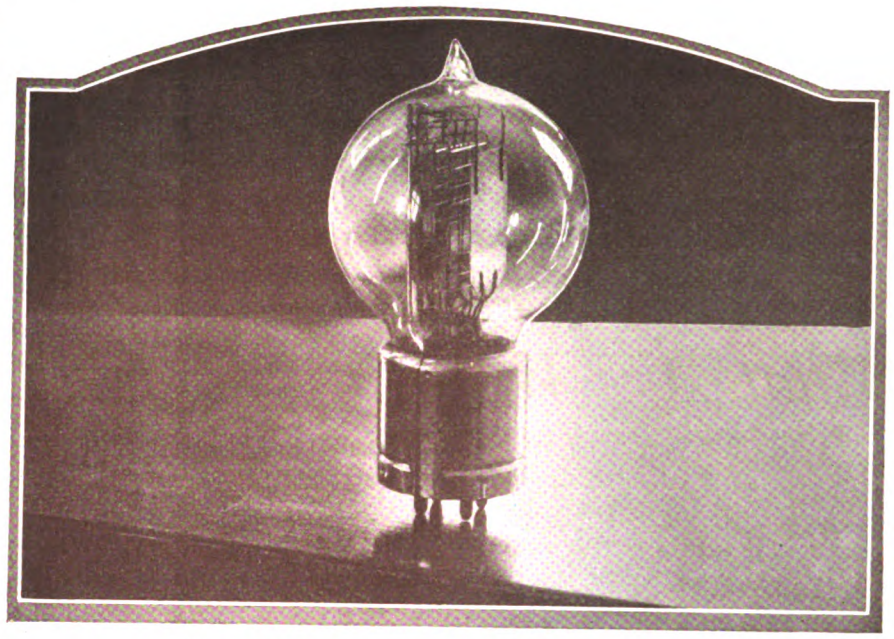
The How and Why of the Vacuum Tube

By Robert W. King

Engineer with the American Telephone and Telegraph Co.

IT seems scarcely necessary to explain to the reader of today that by the Aladdin's lamp of science is meant the far famed vacuum tube. Or perhaps you choose to call it the thermionic relay, or audion or pliotron, or repeater, or three electrode relay. These are all optional terms for the same device. If you were to inquire of the physicist which of these many terms he thought was the most descriptive he very likely would reply, "three electrode thermionic vacuum tube," thereby combining several of the more familiar terms.

Have you ever of an evening listened to the ether-wafted melodies of the radio telephone? If so, you have listened to a product of the vacuum tube. Or have you ever talked over a long distance telephone? If so, you have made use of the vacuum tube, for it was used to amplify the voice currents produced by your speech during their long journey. Or have you read of the ingenious work which was carried out during the war for detecting enemy submarines although many miles away, their sounds being entirely inaudible to the unaided ear? If so, you have read something of the potentialities of this veritable Aladdin's lamp.

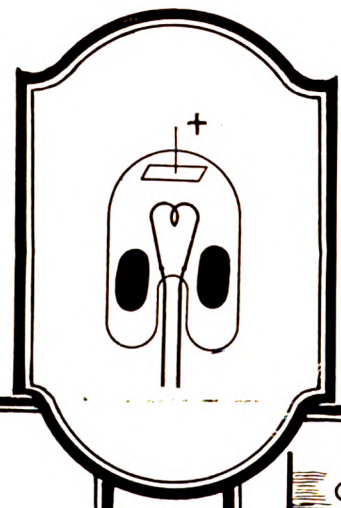


The standard type of telephone repeater vacuum tube. These tubes were developed several years ago by the Bell engineers and were used in the first transcontinental circuit opened in January, 1915. They have been in use in all long distance telephone circuits ever since.

To the wireless telephone, to the long distance telephone and to many of the recently introduced electrical instrumentalities of our day, the vacuum tube is what the keystone is to the arch.

Suppose you were to hand a piece of copper wire to a physicist and ask him what he sees. To you it is a piece of copper wire, reddish in color, ductile, and you know by experience that it is a good conductor of electricity. However, the physicist, aided by all the instruments of his science, sees far more than this. He sees that the wire is composed of metal crystals and that each crystal is an orderly arrangement of atoms of copper all identical to one another. He sees that each atom is composed of two main divisions, a central nucleus and a cluster of little particles surrounding it, somewhat as the planets surround the sun. He has separated these little particles from the nucleus and he finds that they are minute charges of negative electricity, each particle being identical to every one of its brothers. To these particles he has given the name of "electron". These electrons are present in enormous quantities, indeed are one of the constituents of every known substance.

Below—Diagrammatic view of the original Edison thermionic tube or relay.



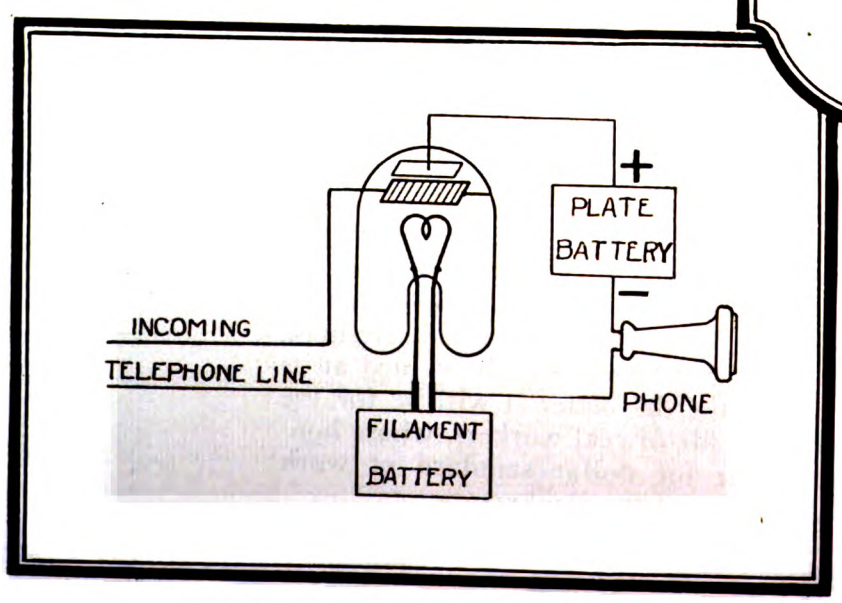
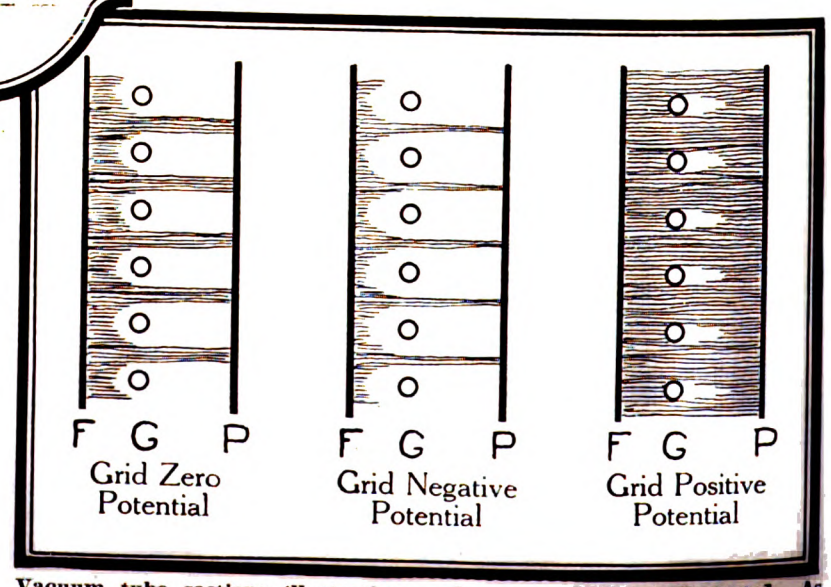
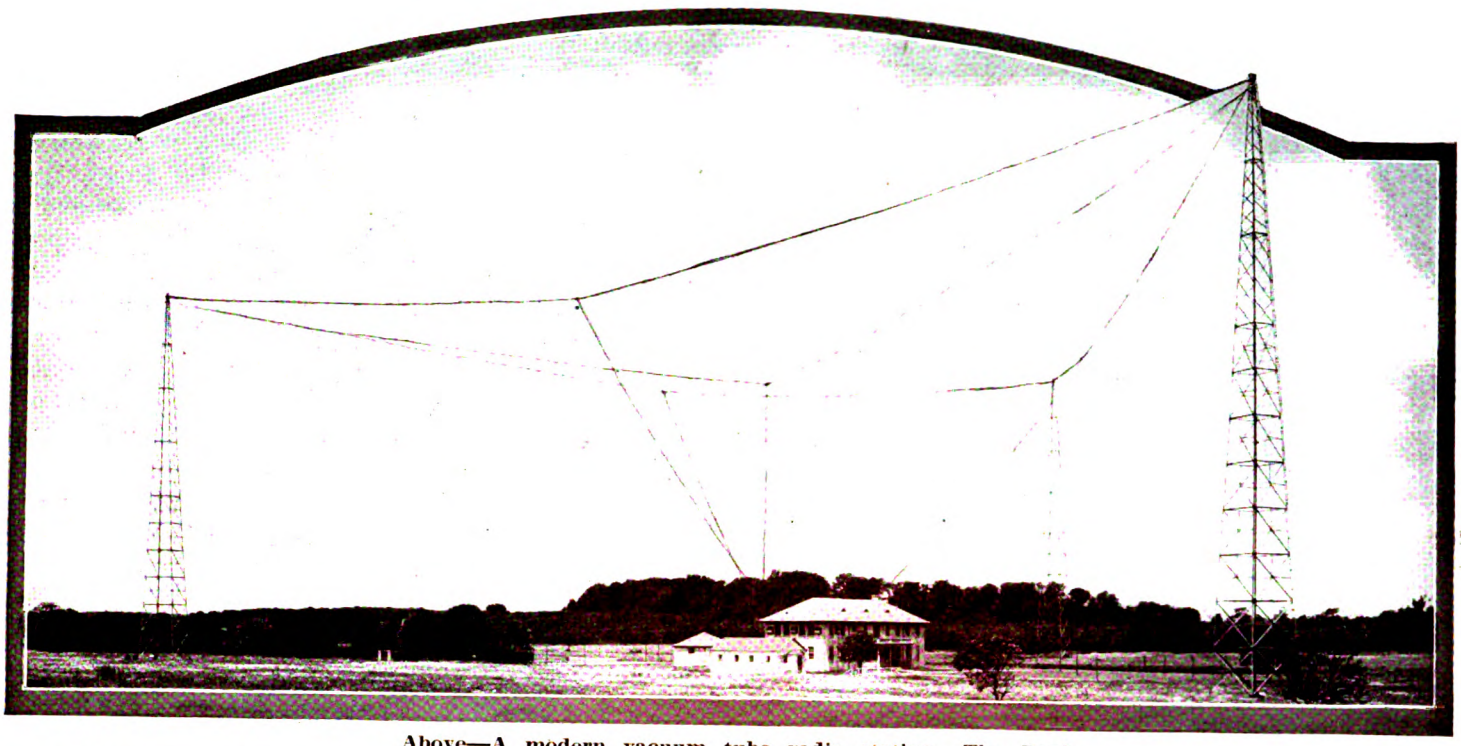


Diagram showing a simple circuit to make use of the amplifying action of the vacuum tube.



Vacuum tube sections illustrating the action of this device. If the electron stream flowing through the grid to the plate were visible we may imagine its appearance to be somewhat as illustrated. As shown with the grid at a negative potential the current passing to the plate is smaller than with the grid at a positive potential.

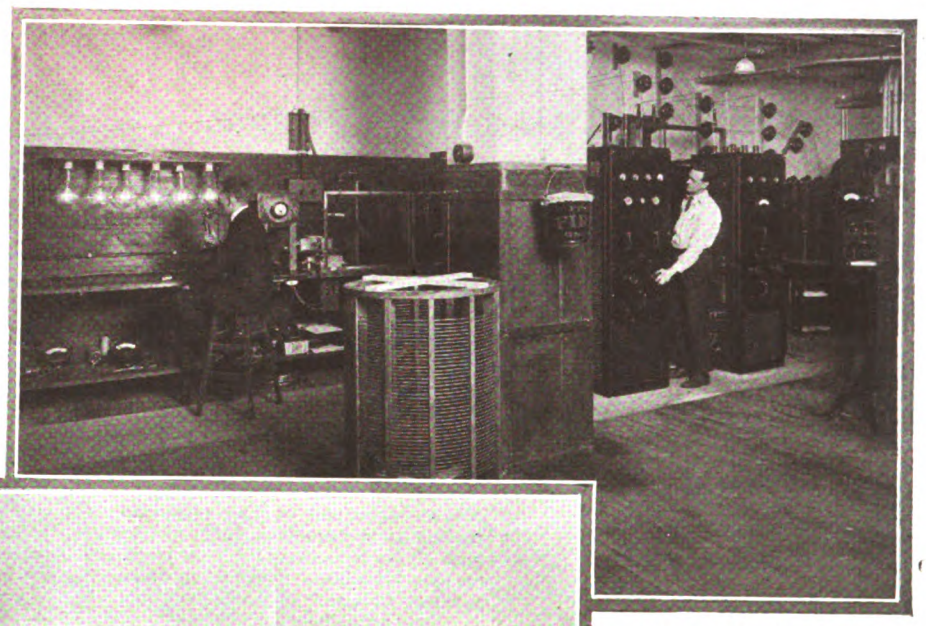
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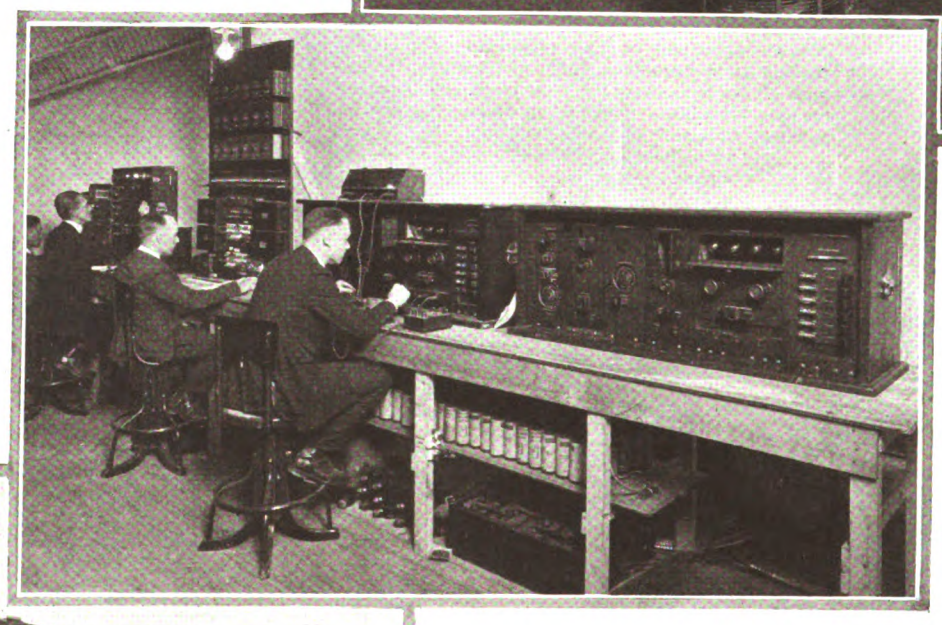
Above—A modern vacuum tube radio station. The Deal Beach station of the Bell System. It is equipped with four transmitting sets and four antennas so that three telephone channels and one telegraph channel can be operated simultaneously.

Nor has the physicist stopped here. In a sense he has isolated the nucleus of the atom and pulled it apart, and he now feels reasonably sure that it is composed of but two fundemental constituents. One of these is the electron just referred to and the other—the so-called "proton"—is a minute charge of *positive* electricity. He has also found that the proton weighs about eighteen hundred times as much as the electron although it carries the same amount of electricity but of opposite sign.

This analysis of the copper wire would apply, as just stated, to practically any of the known chemical elements. But why begin an article on vacuum tubes by such an analysis? The answer is: an understanding of the action of the vacuum tube requires a certain familiarity with the electron and the part it plays in the structure of matter. For instance, the



View of the high power vacuum tube room in the Bell laboratories. This room is equipped with apparatus for supplying large amounts of direct current power at 20,000 volts. Within the panel are two large water-cooled tubes, one acting as an oscillator and one as a modulator. The high frequency oscillations generated by the oscillator are lighting the six one-kilowatt lamps, and the telephone is connected to the modulator so that as the attendant speaks the lights flash and dim.

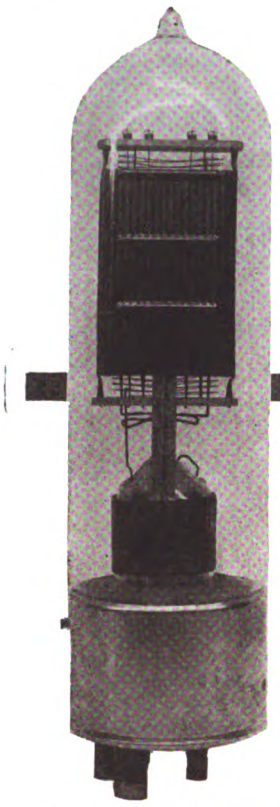


A large vacuum tube amplifier installation. This amplifier is capable of yielding an energy amplification of about one million fold. This is the amplifier which was used to magnify the words of President Harding on Armistice Day and project them to 30,000 persons in New York.

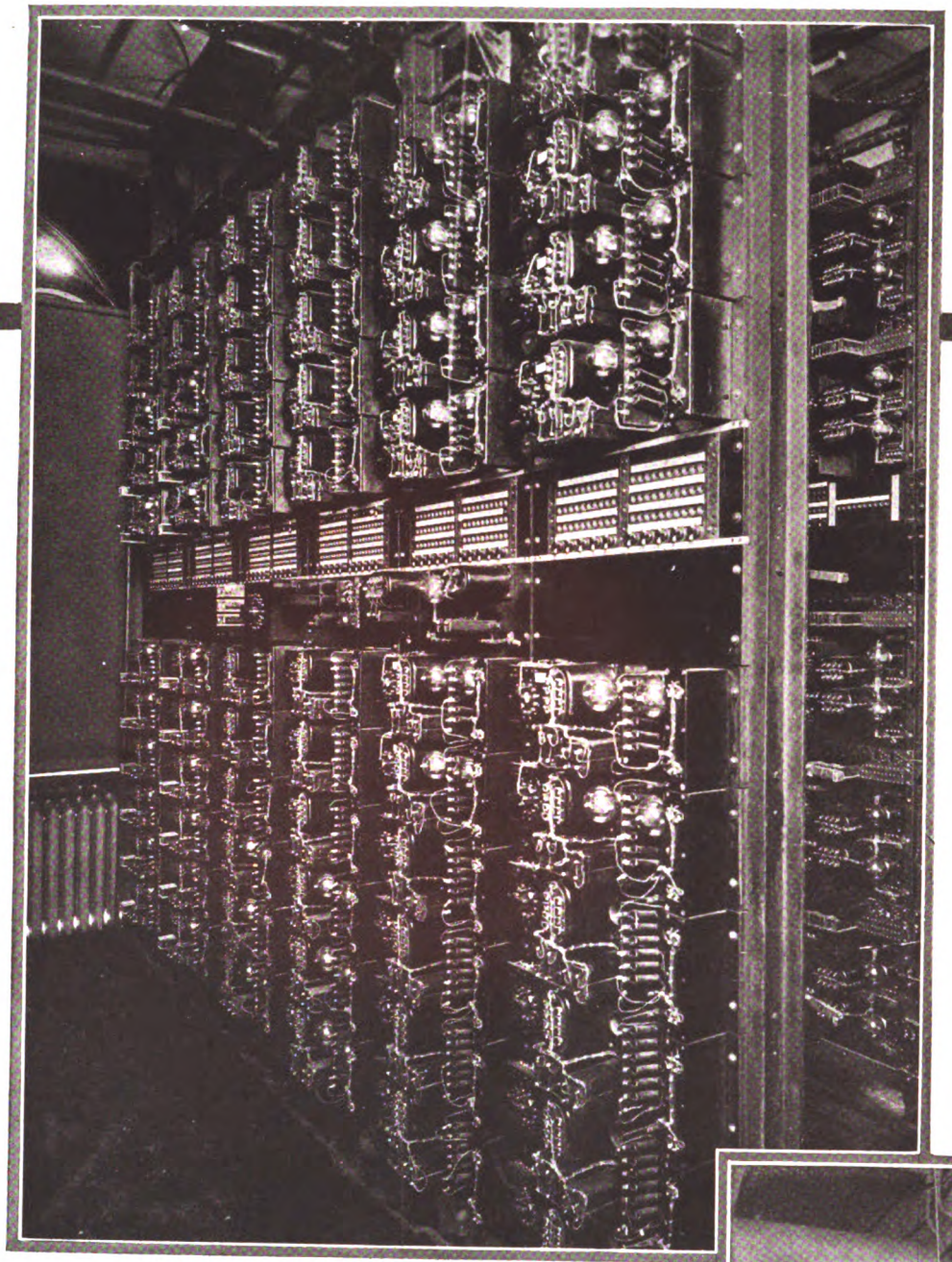


A typical telephone repeater station (Princeton, N. J.). This station houses the 320 vacuum tube repeaters which are essential to the operation of the telephone cables between New York and Philadelphia. These circuits also reach Baltimore, Washington, Pittsburgh and other cities.

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A large size radiation cooled vacuum tube capable of delivering 250 watts of high frequency power. It is tubes of this type which are being used at the Deal Beach radio station of the Bell System in experiments on ship-to-shore telephony.



Above—Glimpse of the telephone repeaters as installed in a repeater station. In the New York to San Francisco circuits repeaters are located at intervals of about 250 miles, there being twelve repeaters in each circuit. What these repeaters accomplish can be pictured as follows: If the entire energy radiated by the sun were converted into electrical power and all applied at one end of a transcontinental circuit it would only be sufficient to produce a barely audible sound at the other end. By relaying messages at frequent intervals the power required is quite insignificant and a very great saving in copper wire is effected.

conduction of electric currents is intimately tied up with these electrons.

In a wire, and in any metal in solid form, there is every reason to believe that certain of the constituent electrons can migrate, under certain circumstances, from atom to atom and indeed can traverse the entire length of wire although it be many thousands of miles long All that is needed to move these migratory electrons is a driving force such as is supplied by a battery or dynamo. In other words, when you join a wire to the two poles of a battery and cause an electric current to flow that current is simply the migration of some of the electrons which are naturally present in the wire.

If you cut the wire—that is if you break the circuit—the current ceases to flow for the electrons cannot leave one of the cut ends and jump across the gap to the other end. Right here is where the vacuum tube comes in. It provides a means

(*Continued on Page 35*)

Below—A bank of pumping stations showing operator sealing off exhausted repeater tubes.





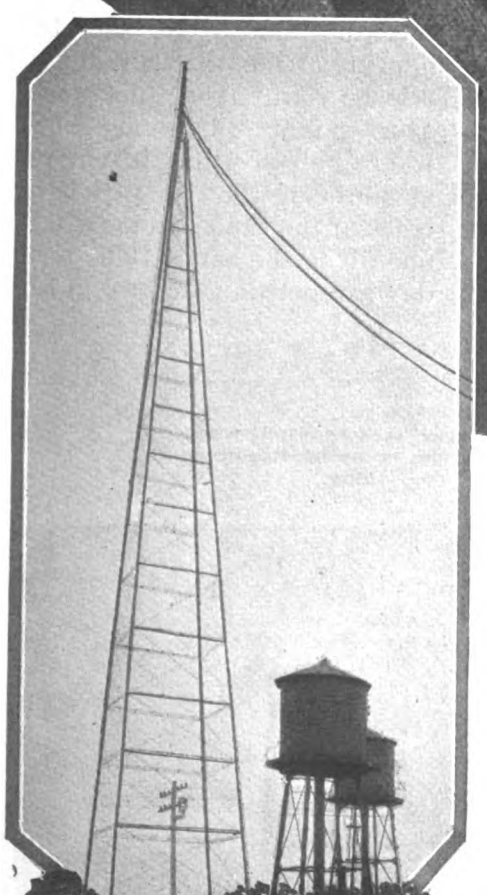
At the left—View of a partially assembled 10-kilowatt water-cooled vacuum tube. These tubes are the products of the Bell System research laboratories and their success is very largely due to the ingenious work of Mr. W. G. Housekeeper. They have been developed for long distance radio. The positive electrode in this tube takes the form of a copper tube inclosing the filament and grid. The vacuum in these large tubes is as high as that in the small sizes.

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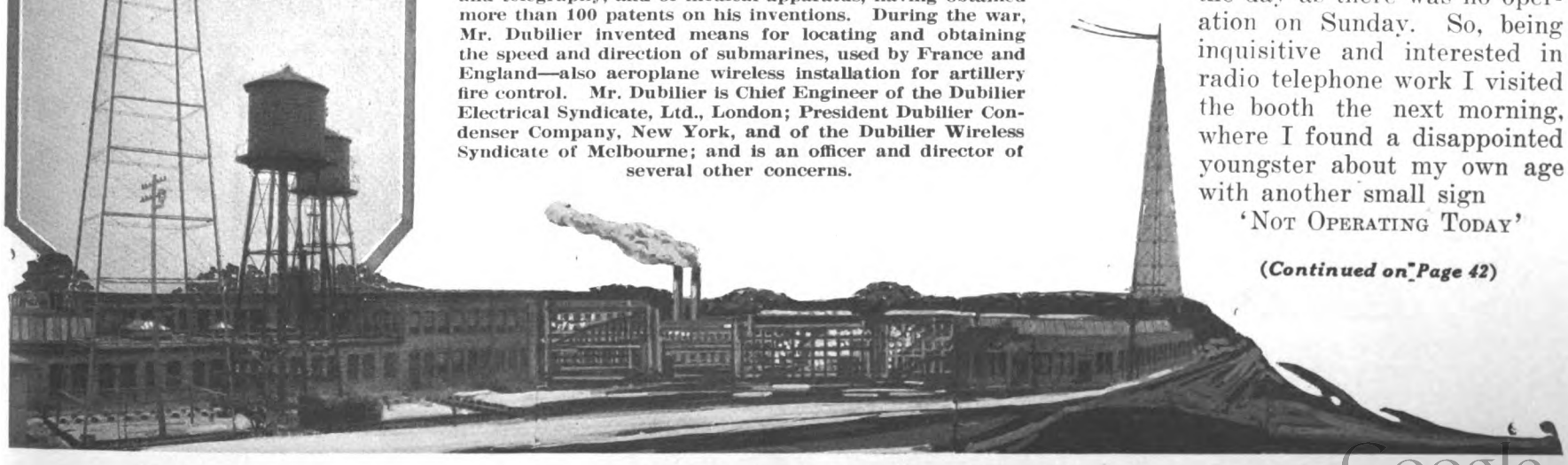
The Future of the Radio Telephone

An Interview with William Dubilier





William Dubilier was born in 1888, in New York City's "East Side." He studied at DeWitt Clinton High School, and later studied electrical engineering at Cooper Union, working at night in a telegraph office to earn his living. He is the inventor of several systems of wireless telephony and telegraphy, and of medical apparatus, having obtained more than 100 patents on his inventions. During the war, Mr. Dubilier invented means for locating and obtaining the speed and direction of submarines, used by France and England—also aeroplane wireless installation for artillery fire control. Mr. Dubilier is Chief Engineer of the Dubilier Electrical Syndicate, Ltd., London; President Dubilier Condenser Company, New York, and of the Dubilier Wireless Syndicate of Melbourne; and is an officer and director of several other concerns.



THE sudden, and literally overwhelming, interest in radio broadcasting during the past few months has reached such proportions that everywhere—in department stores, phonograph stores, even in drug stores— one finds a Radio Department where the novice can learn something about this newest wonder and can hear the music and lectures sent out from nearby broadcasting stations. Even the most staid and conservative business houses, newspapers and periodicals have been swept off their feet, and are enthusiastically helping to swell the tide.

In the flood of material that has been published—much of it inaccurate—there has been, of course, a great deal of impossibly fanciful speculation as to the future development of this new art. It seemed to the editors an opportune time for securing the opinion of a man who, so to speak, grew up with radio as a bedfellow. So we asked Mr. William Dubilier what he thought about the future possibilities of the radiophone, and just how he had come to interest himself in it years ago.

"In 1910 and 1911," said Mr. Dubilier, "I had a laboratory in Seattle, Wash. where I was living at the time. One warm evening during July, 1911 I visited a West Seattle amusement park. I noticed an unusual sign which read:

'Listen To The Music, Vaudeville And Jokes By Wireless Telephone —10¢'

But the place was shut up for the day as there was no operation on Sunday. So, being inquisitive and interested in radio telephone work I visited the booth the next morning, where I found a disappointed youngster about my own age with another small sign

'Not Operating Today'

(Continued on Page 42)

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The Psychological Aspect of Piece-Work

By W. H. Holmes



Production that builds as fast as removed. Simply work against the neverending material and watch the clock.

IF I were to be offered a liberal day's pay for simply lifting up a brick and then placing it down again, and continuing that for a day—I would refuse the job!

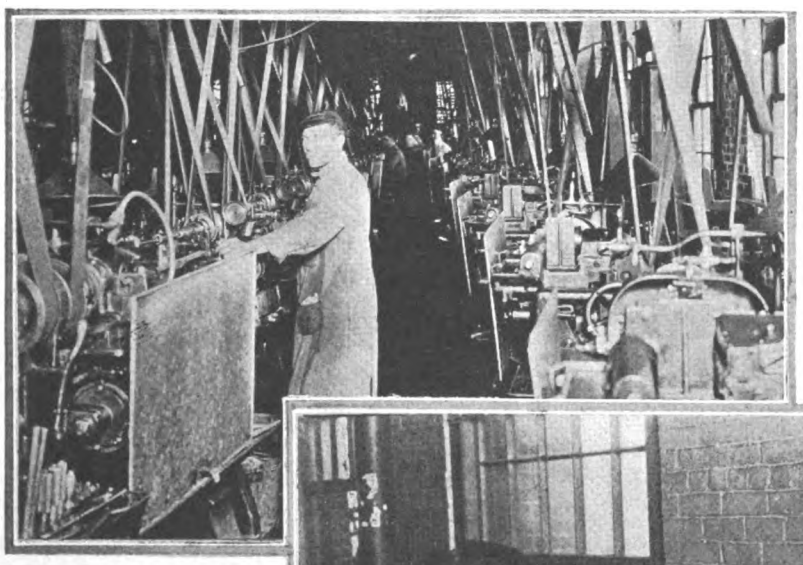
Barnum once tried that on a man who applied for work. The man refused the offer. Barnum stated that the man did not want work. He did, or he would not have sought it. He wanted work but he probably felt that he wanted to accomplish something by working.

The day hand, working against a mountain of production, that builds as fast as it is removed, is lifting a brick and setting it down again. He can not continue doing it and remain contented.

The dull, monotonous work that gets nowhere is that of working from whistle to whistle. The day's labor becomes a grind, and the workman is either ground into a rut or is rasped into a discontented hand. It is not a question of welfare schemes, rotating tasks, shifting from one department to another, or any other poultice that in its compounding fails to incorporate something for mental ills, that will cure the brooding employe. He enters the shop to earn so much money that he may live. *What he does* in earning this money is the vital question.

A man working by the day is putting in ten, nine, or eight hours as the case may be. His income is fixed; if he works a week he will receive so much. At quitting time he is finished, therefore he has nothing to interest him except pay-day and the clock. He is a cog; a whistle-prisoner, with life gauged by the dragging moments. He becomes either a laggard, a malcontent, or a fixture in the concern. He is a detriment when fixed at any one of the three.

Take for example the workman who enters the shop at seven o'clock in the morning. The work is there, stacked on the bench before him. The whistle blows and the day's work is off. Now, there is nothing that you can offer that man to look forward to, or to interest himself in, but the blowing of the whistle that will release him from his task. You might place a clock where he *can* watch it, but regardless of that he will keep track of the time. In the afternoon it is the same. The next day a repetition, and so on for

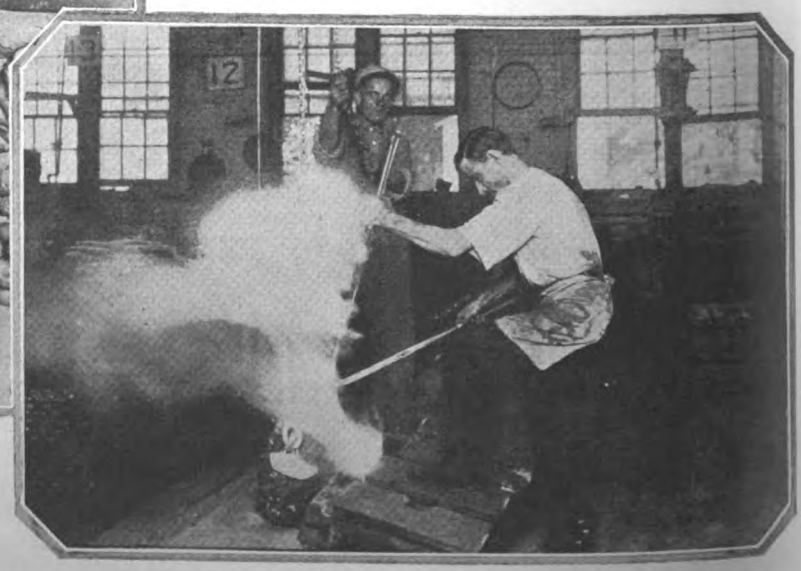


On piece work, when his machines are running in proper form, then he may have time to chat a moment, thus getting away from the feeling of being watched.

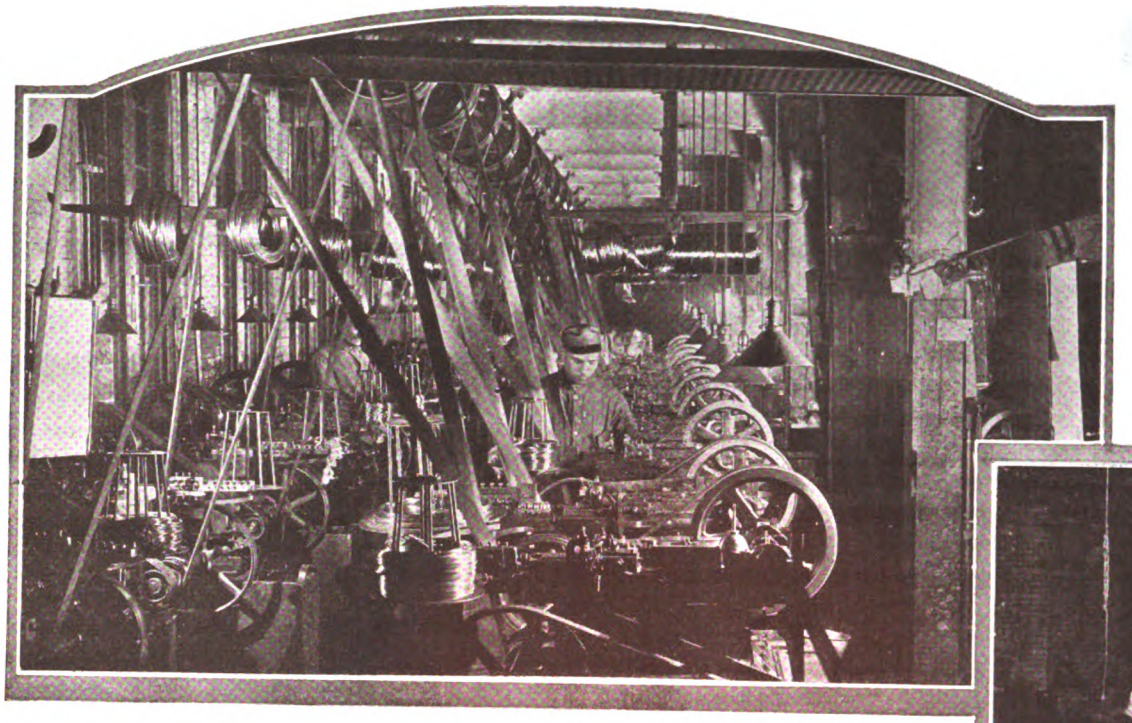


Seven o'clock finds the worker starting in at the never-ending task.

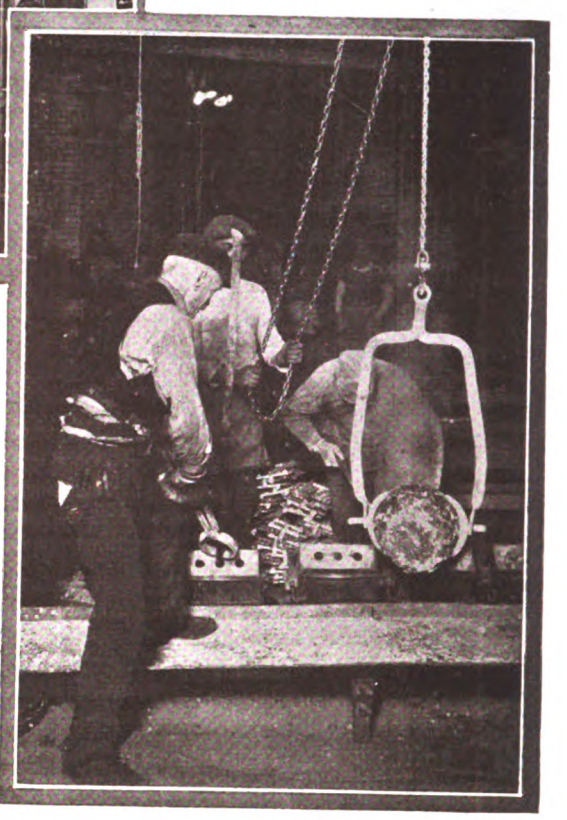
The worker is interested when he feels that he is accomplishing something.



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On Automatic machines the worker has adjustments to make and his machines to keep running. He has no time to become discontented.

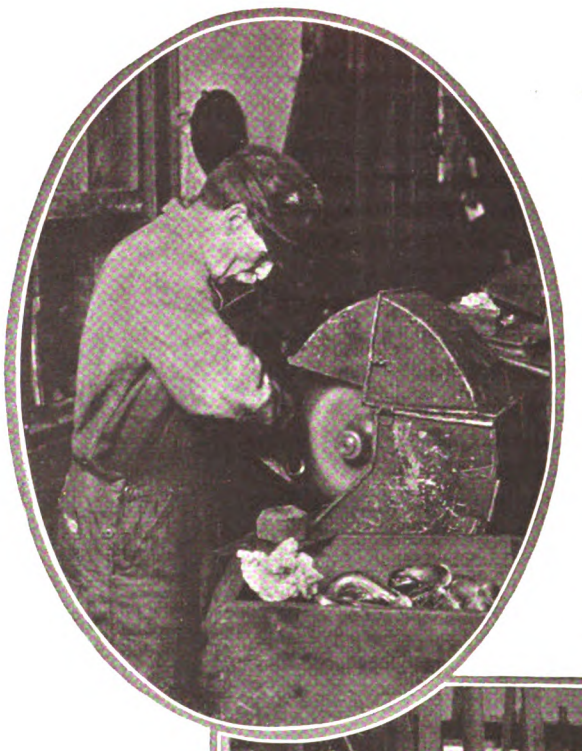


The Piece worker has no time to listen to agitation.

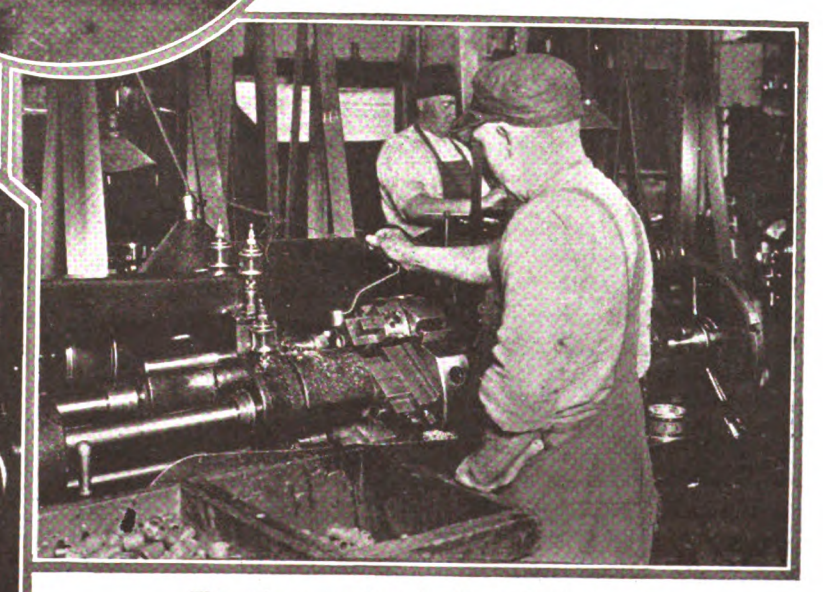
year after year. How can he be progressive, contented, and industrious? You are killing his spirit by monotony, with nothing to offer that would afford relief.

The piece-worker enters the shop with something of the blood of the speculator in his veins. We are all gamblers by instinct. If his work runs smoothly, and he applies himself to the task, he will earn a day's pay. His task, say, is a thousand pieces. His interest, all day, is centered on getting out that thousand. If he fails, he fails trying. Tomorrow he has an added interest in making up for lost time. If his job runs well, perhaps he has a small amount of time at his disposal when he may limber up and relieve the strain without looking around to see is the Foreman is watching. In a few moments he is back at his task and he is renewed.

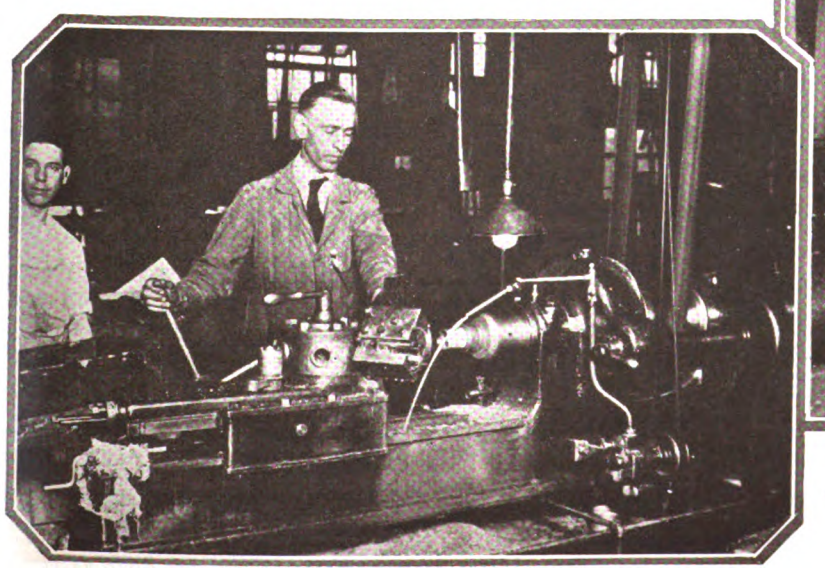
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Simply working against time and power makes for discontent and change.

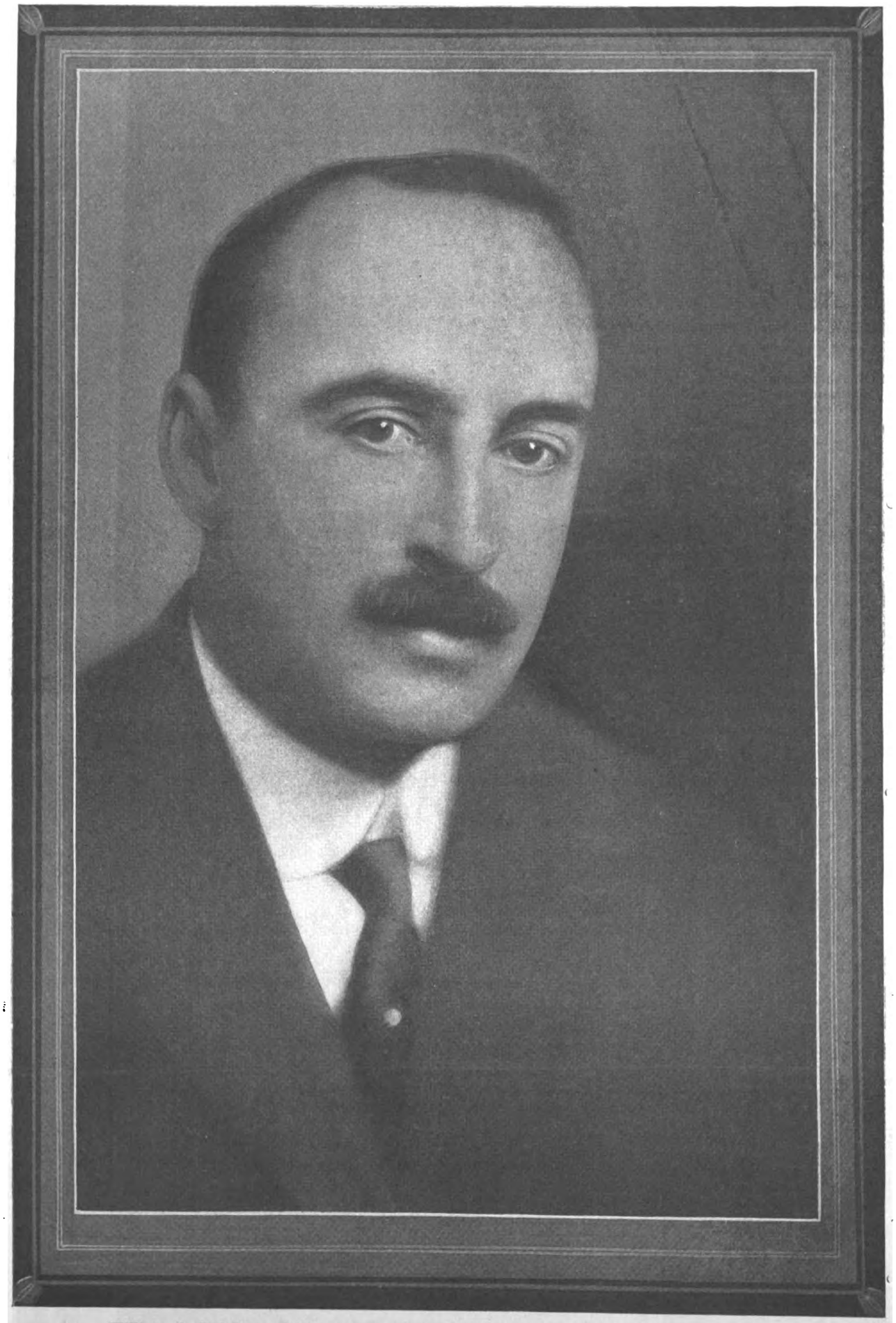


The piece worker is busy because it pays. When the worker's one man manufacturing plant breaks down, then there is interest in getting it going again.



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The Engineer in Relation to Manufacturers' Dividends



William A. Del Mar, chief engineer of the Habirshaw Electric Cable Company since 1918, was born in San Francisco in 1880. He graduated in electrical engineering at the City and Guilds College, London, in 1900, and specialized in electric transmission for electric railways until 1918. Mr. Del Mar's interest in insulating materials dates from the days of his railroad career, when he was very active in improving relations between cable manufacturers and users through the agency of various standardizing committees. He has been a member of the Standards Committee of the A. I. E. E. since 1915, has served on its Board of Directors for five years, and is now vice-president for the New York District.

By William A. DelMar

THE position of the engineer in manufacturing companies was long an indefinite one. Originally he was regarded as an inventor, then as a designer, but his success in putting manufacturing on an efficient basis widened his scope in one direction, and his invasion of the selling field, as sales engineer, widened it in another. While there are places for the engineer in both manufacturing and selling, his principal function in a manufacturing concern is, in my opinion, to serve as the connecting link between the market and the factory, to the ends that the factory may make what the consumer needs and that the consumer will want what the factory makes. This double link is essential to the prosperity of any manufacturing company but the fact that the maintenance of this link is a special and essential function is often hazily perceived and only one half of the two links is established; usually that which tends to make the consumer want what the factory makes. This is done by advertising, or personal sales efforts and the need of an engineer is not always apparent. The other half of the link, that which keeps the factory alive to the consumer's needs, while of less immediate importance than the first, is of greater ultimate importance because upon it, whether left to chance or wise design, the future prosperity of a manufacturing concern depends.

In the engineering industries, and to a considerable extent in others, the study of the consumer's needs must necessarily be made by engineers. Now the two halves of the link between factory and consumer are inter-dependent and, to be maintained efficiently, must be considered as a unit by one responsible person.

Once this is granted the responsibility of the engineer is clear. He is the man who

(Continued on Page 44)

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Engineering Methods Applied to Agriculture

By William B. Jackson

NOW that agriculture is getting back to normal after the extraordinary conditions of the war, it is a good time to consider for a moment what it really means as a stabilizing influence in connection with the prosperity of the nation. Very few of the more than a hundred million inhabitants of the country have any considerable appreciation of what agriculture really is, notwithstanding its basic importance in the nation's affairs.

We read a great deal of the need for legislation in the interests of the farmer, but can anyone tell what can be done along legislative lines to greatly help the farmer in broad and constructive ways, further than is already being done to a greater or less extent in every state of the union and by the General Government itself. Very little can be expected from legislation except in strengthening the work now under way in training men to be expert agriculturists and in providing information necessary to the farmer which can be obtained only through centralized organization with necessary funds for accomplishment. Of course some help can possibly be given by providing more flexible farm credits and the like, but the real possibilities are along lines of education. This phase of the matter can hardly be over done if carried out along sound practical lines. This brings us squarely to engineering methods in agriculture, which means "development of methods of controlling the forces and of utilizing the materials of nature for the benefit of man, and the art of organizing and directing human activities in connection therewith" in the primary and most important line of human endeavor.

In the East, and to a certain extent in the West, a deep seated feeling exists that anyone taking up the business of farming, except as a fad or on some

(*Continued on Page 52*)



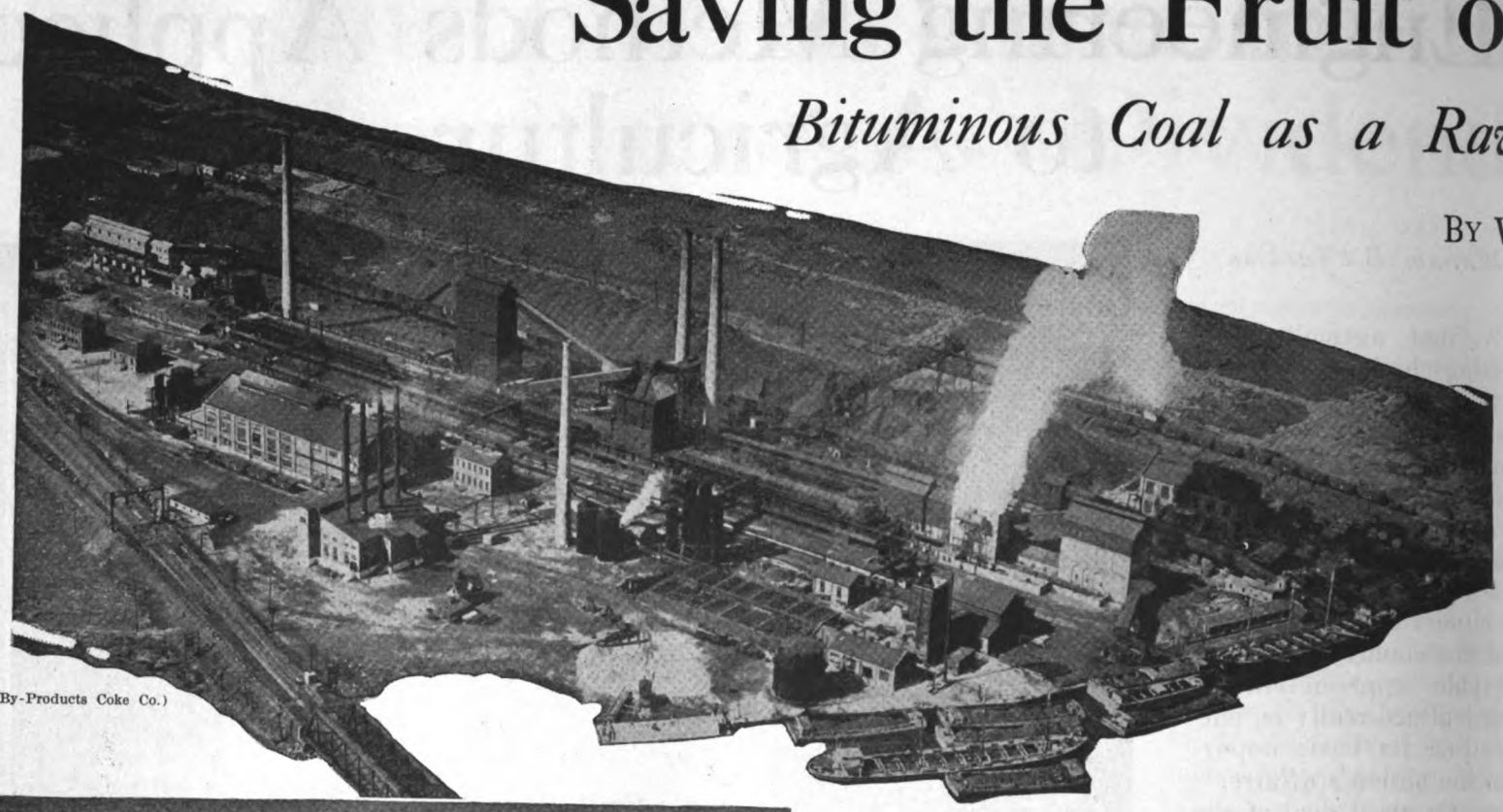
William Benjamin Jackson was born in Pennsylvania in 1870. He graduated from the Pennsylvania State College with the degree of B. S. in Mechanical Engineering, and in 1895 received his M. E. degree. Mr. Jackson has had a wide and varied engineering experience, both in this country and abroad. He is now a consulting engineer and is the owner and operator of Broadview Cattle Ranch, Cheshire, Mass. He is a life member of the A. I. E. E., A. S. M. E., and A. S. C. E., and a member of the Western Society of Engineers, American Gas Institute, National Electric Light Association, American Street and Interurban Railway Association.

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Saving the Fruit of

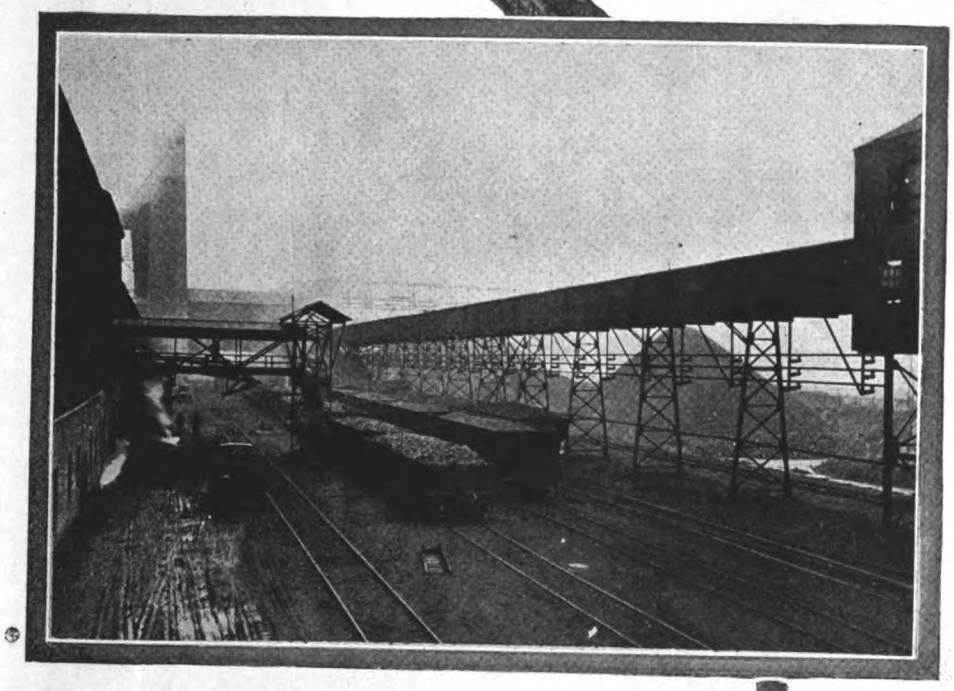
Bituminous Coal as a Raw

By W.



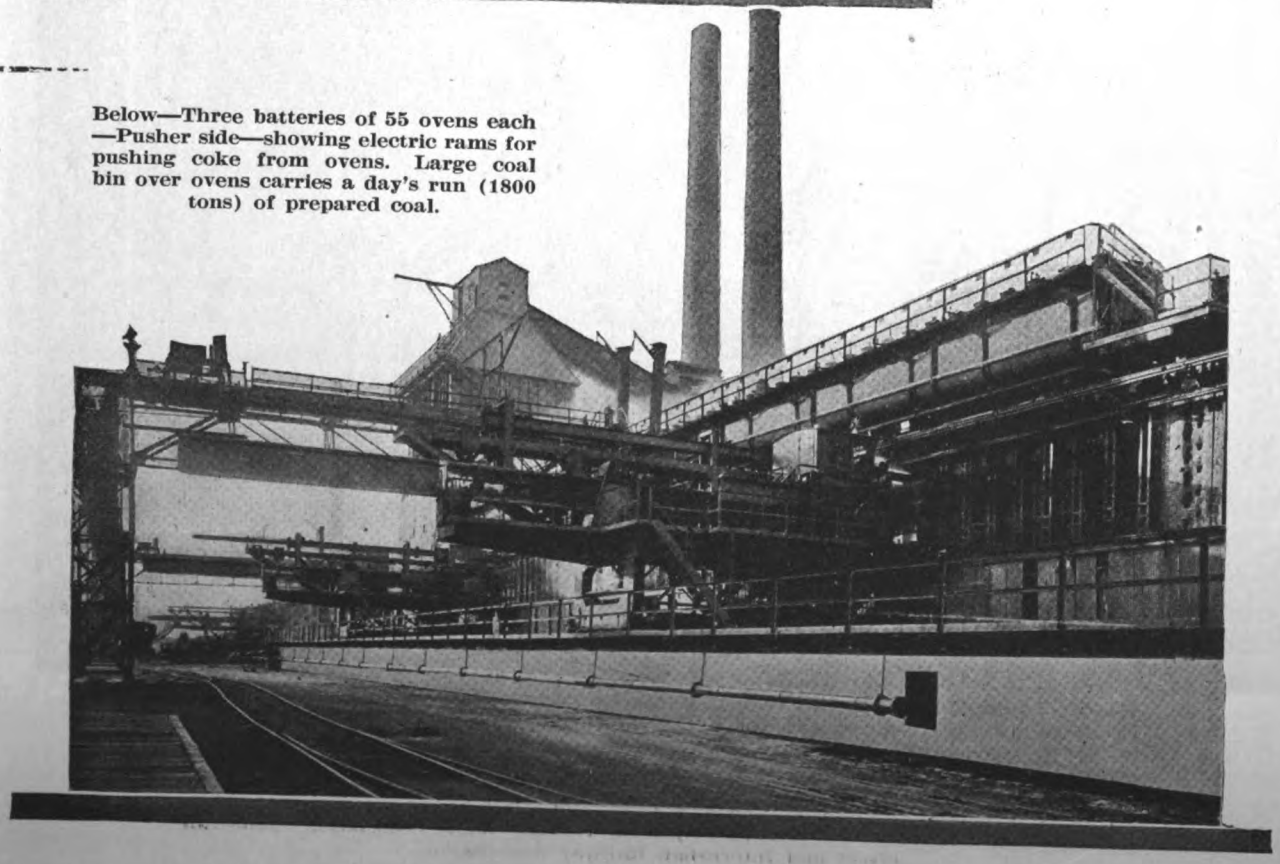
(Seaboard By-Products Coke Co.)

Airplane view of the Seaboard By-Product Coke Plant, at Kearney, N. J.; one of the largest producers of coke in this country.



Cars of coal waiting to be unloaded. Screening station at the left; Belt conveyor, which brings coal from boat unloader, at right; Storage pile in the right background.

Below—Three batteries of 55 ovens each —Pusher side—showing electric rams for pushing coke from ovens. Large coal bin over ovens carries a day's run (1800 tons) of prepared coal.



OVER on page 24 of this issue is a picture of a tree. Unlike most of the trees which have their pictures published, this one is less than thirty years old; yet it is more valuable, and of greater importance to every man, woman and child in the country, than all the famous redwoods, lone pines and historic oaks put together. If every industrial executive and financier and householder could be made to appreciate just what this tree signifies, this country would take a step forward in economic progress more far-reaching even than the adoption of steam power a century ago.

Chemists know, engineers know—but until a great body of public sentiment is fully awakened to the facts, there will continue to be apathy and indifference on the part of the Government; until this awakened sentiment makes itself felt, we will go on committing our great national crime of burning up one of the greatest assets with which nature endowed us—the so-called "By-Products" of bituminous coal.

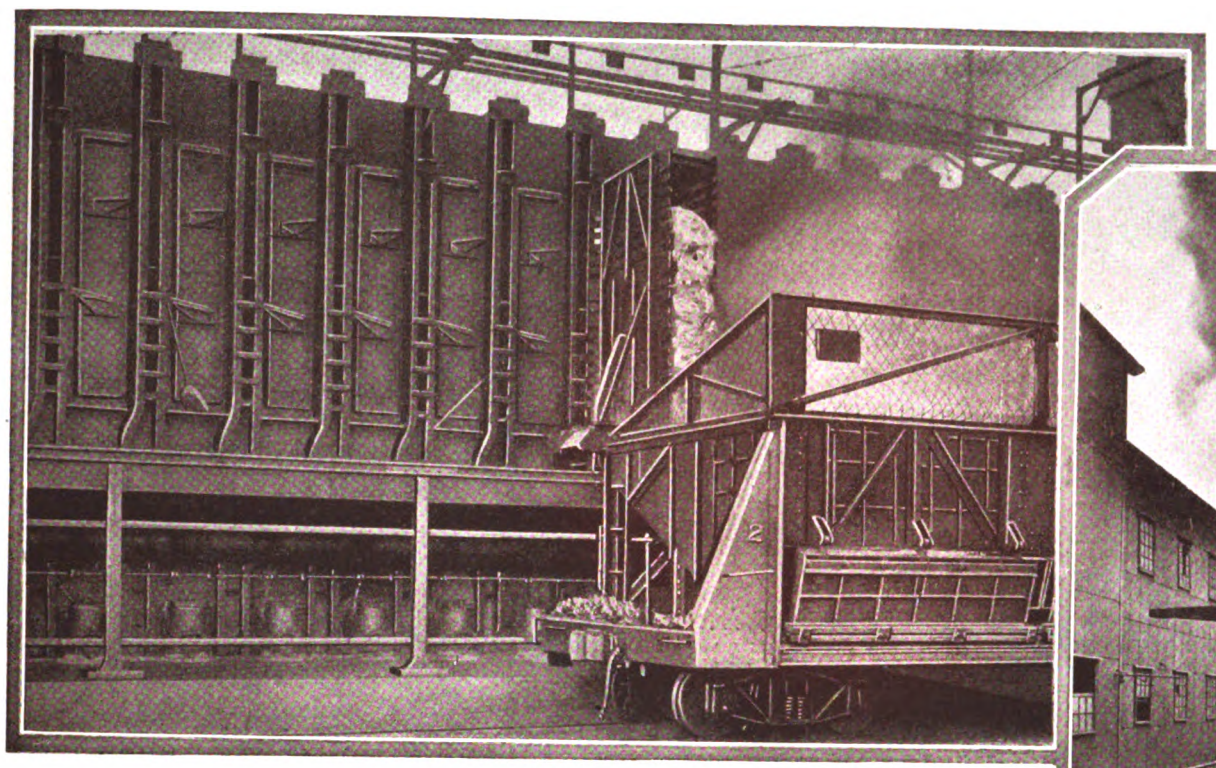
At the present writing, a strike has tied up the production of bituminous coal at the mines. It is conceivable that by next winter there may be such a shortage as to compel the closing down of many

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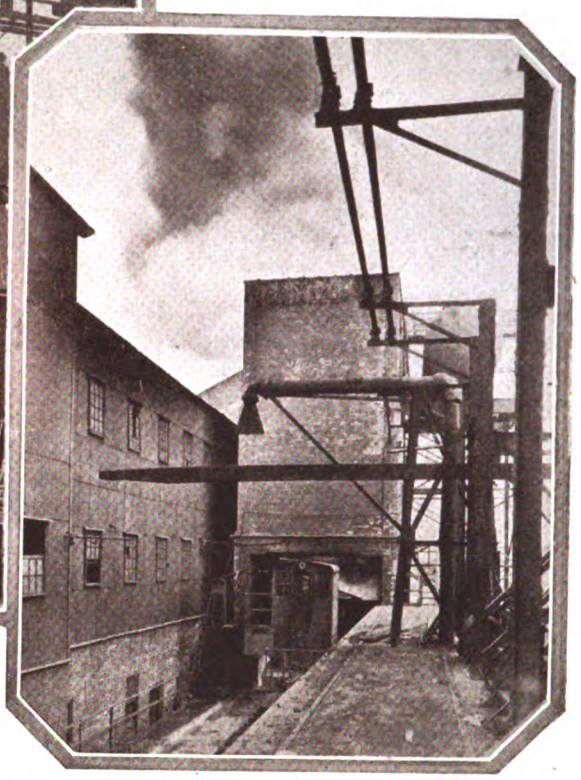
The "Coal Tree"

Material, Rather than a Fuel

THOMSON LEES



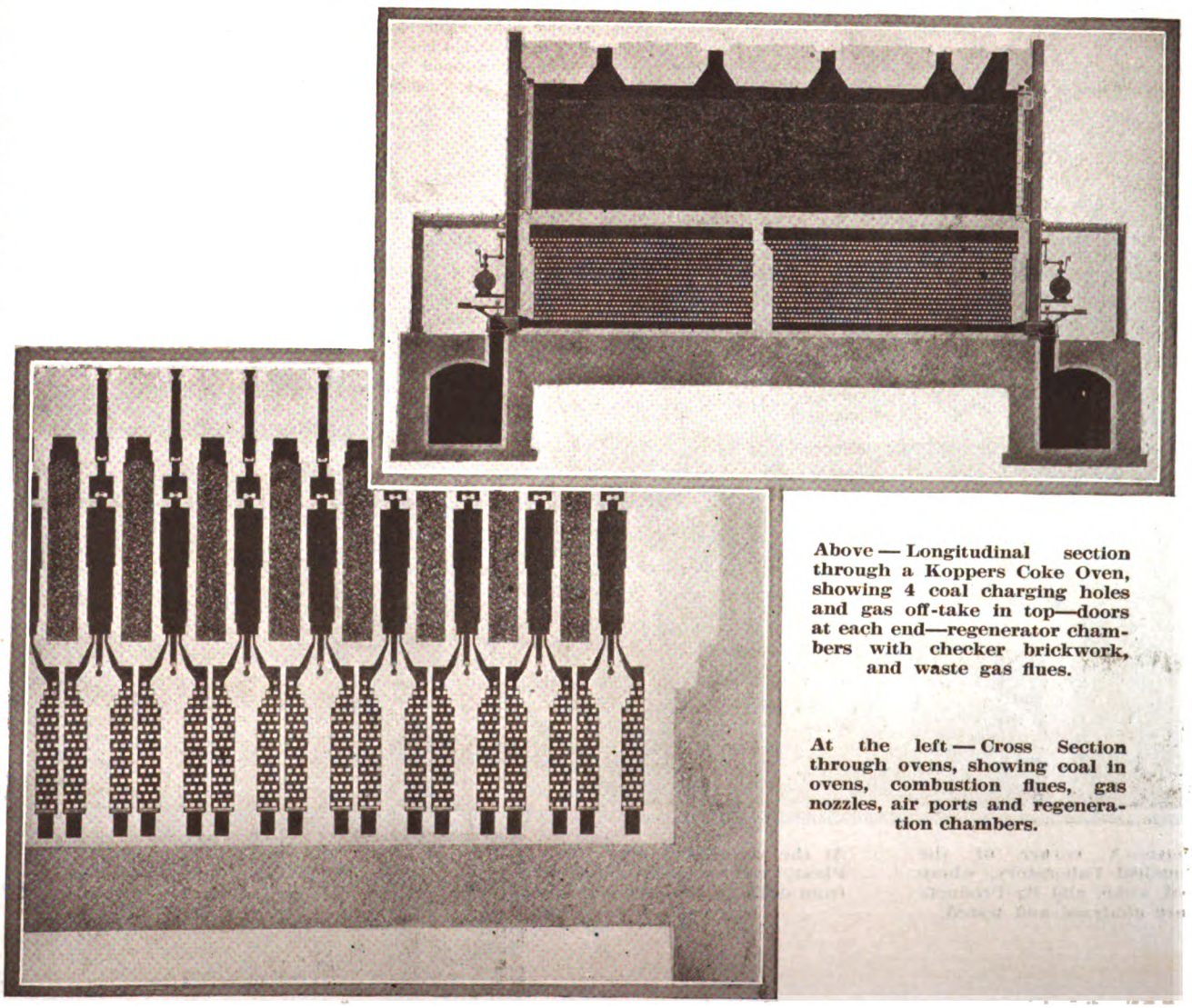
Quenching car receiving coke as it is pushed from the oven by a ram.



Below—Quenching station, with quenching car under bath; coke being quenched.

plants which rely upon bituminous coal for power production. If such a crisis should arise, suppose one of these plants decided to keep going by burning under its boilers all the mahogany furniture and all the frame houses it could lay its hands on. What a roar of indignant clamor would ascend from every quarter! Yet such a procedure would be no more truly wasteful than the routine of burning bituminous coal under those same boilers.

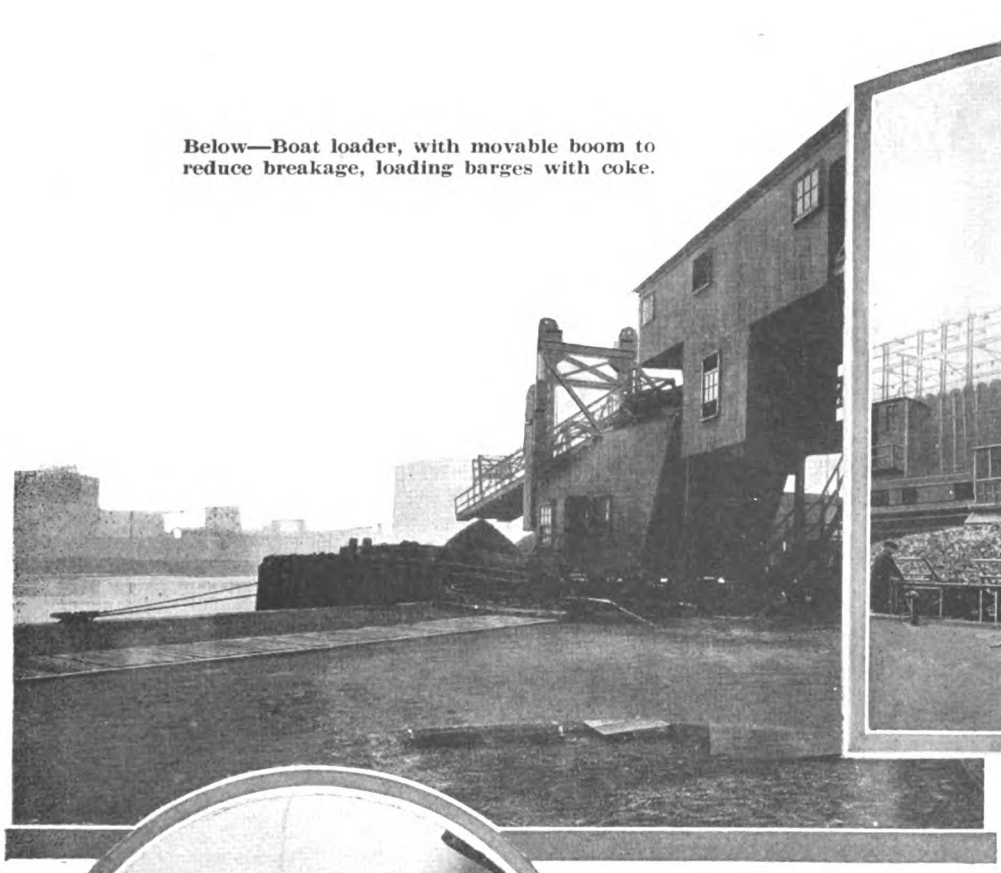
In 1915, before war conditions had begun to affect the price of coal, the average value of bituminous coal at the mine was $1.13 a ton. Each 2000-lb. ton of bituminous coal, however, contained within itself the following: 1500 lbs. of coke, with a market value (at point of production) of $5.00; 10,000 cubic feet of gas, worth $9.00; 22 lbs. of ammonium sulphate, worth 61 cents; 2½ gallons of benzol, worth 75 cents; and 9 gallons of tar, worth 23 cents. In other words, one ton of bituminous, *as fuel,* was worth $1.13; the same ton of bituminous, as a *raw material,* was worth $15.59 after coking and recovering the by-products. It is not any insurmountable diffi-



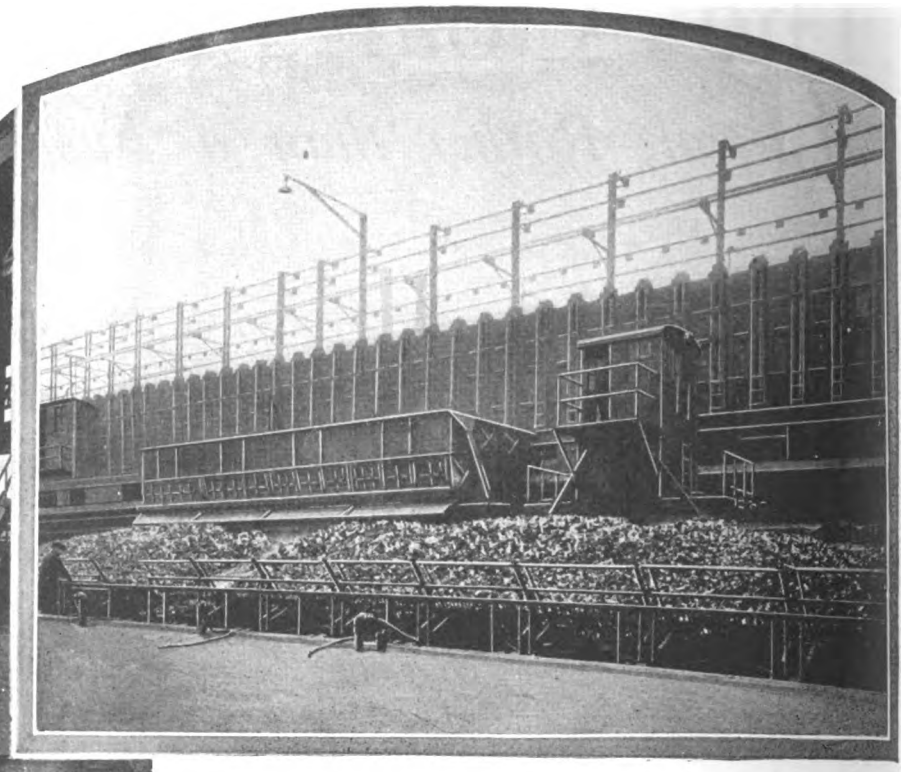
Above — Longitudinal section through a Koppers Coke Oven, showing 4 coal charging holes and gas off-take in top—doors at each end—regenerator chambers with checker brickwork, and waste gas flues.

At the left — Cross Section through ovens, showing coal in ovens, combustion flues, gas nozzles, air ports and regeneration chambers.

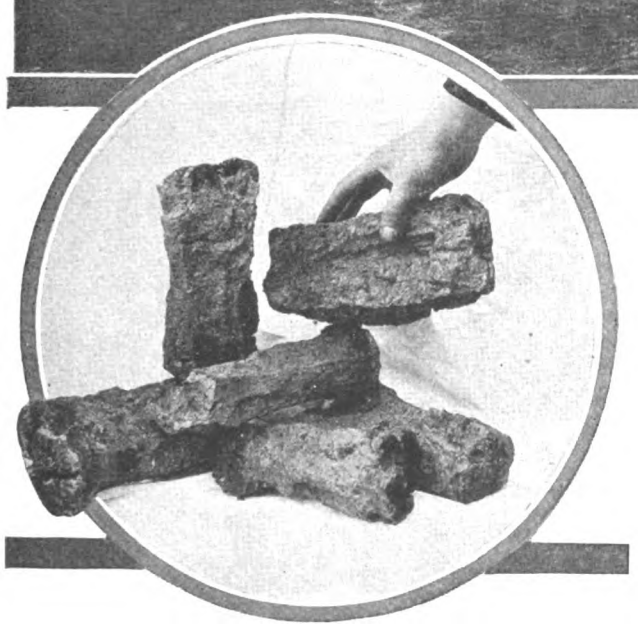
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Below—Boat loader, with movable boom to reduce breakage, loading barges with coke.

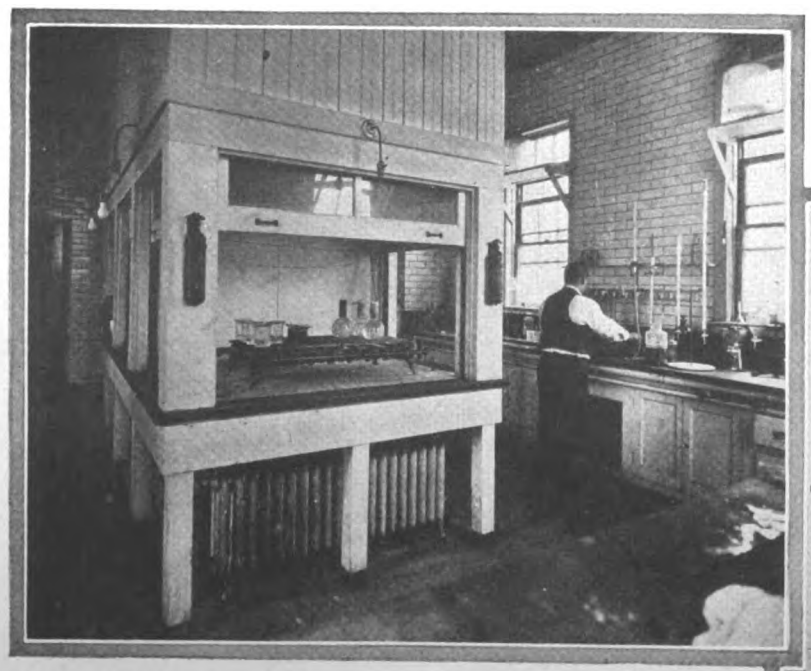


Above, at the right—Coke cooling and drying on the coke wharf. Electric locomotive and quenching car, and, in background, battery of ovens.

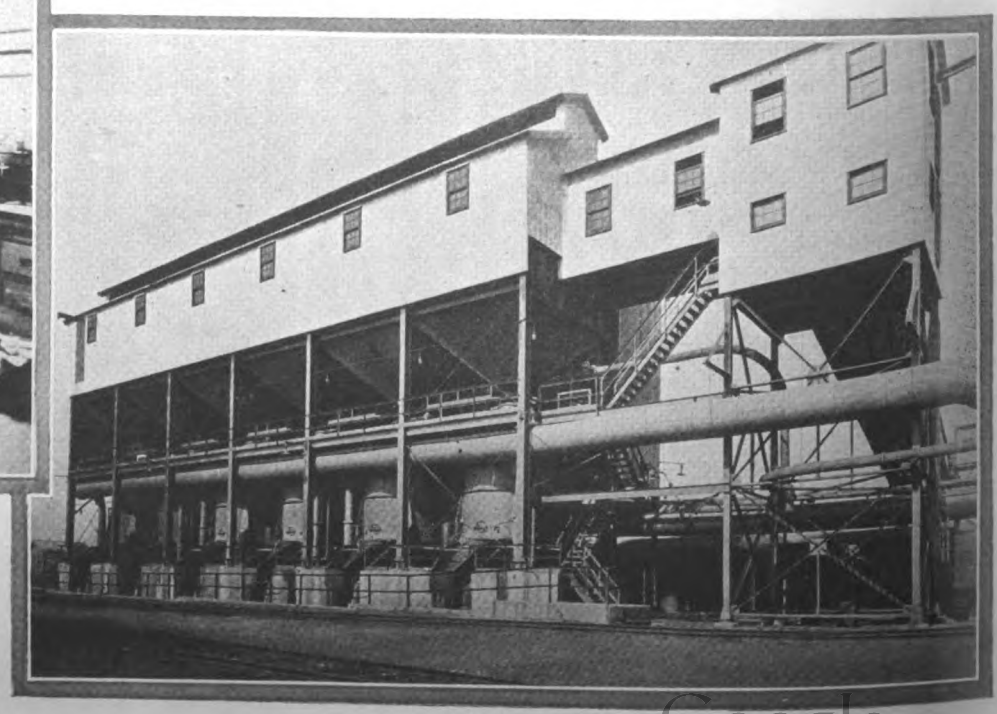


At the left—Samples of typical foundry coke, of close grain and hard texture, produced by the by-product oven.

culty, nor prohibitive cost of by-product recovery, that permits this waste to continue; it is merely a lack of foresight on the part of all of us, and the inertia and resistance to change on the part of those industries which, being the largest consumers of bituminous coal, should take the initiative in correcting the situation. There are a number of by-product coke oven installations in successful operation; if users of bituminous coal could be educated to the many advantages of coke as a fuel, the demand for the latter would stimulate expansion of the all-important by-product coke industry. And with this expansion would come cheaper motor fuel (from benzol); more and cheaper tar, with resultant stimulus to the "good roads"

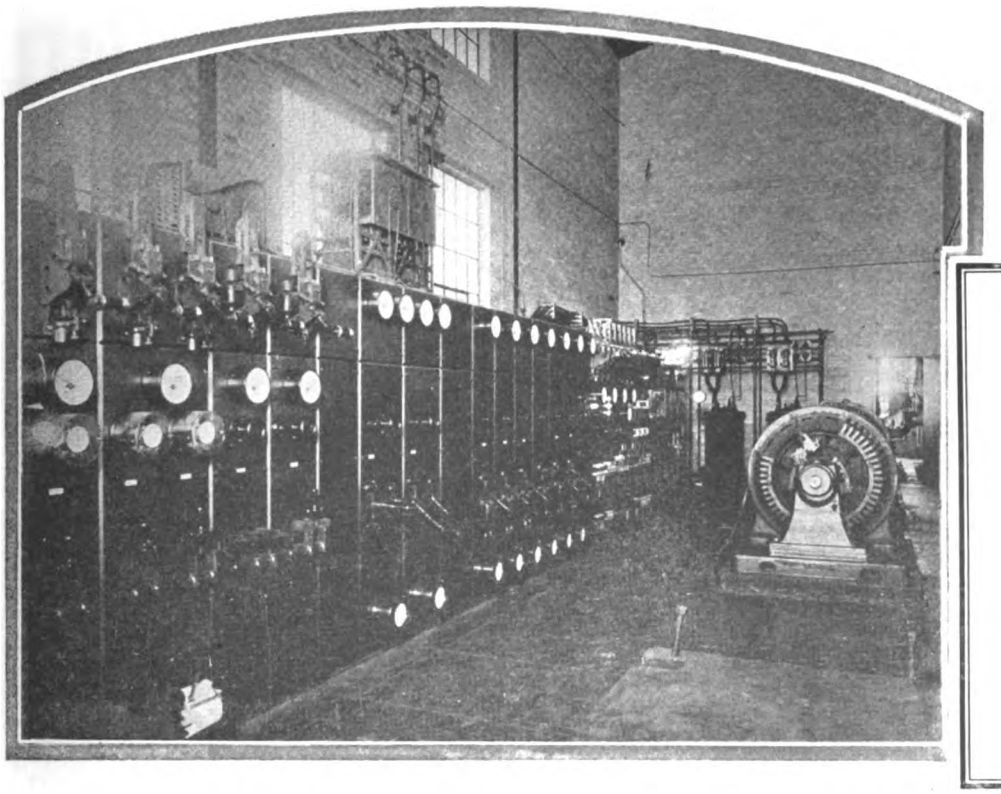


Above—A corner of the Chemical Laboratory, where Coal, Coke, and By-Products are analyzed and tested.



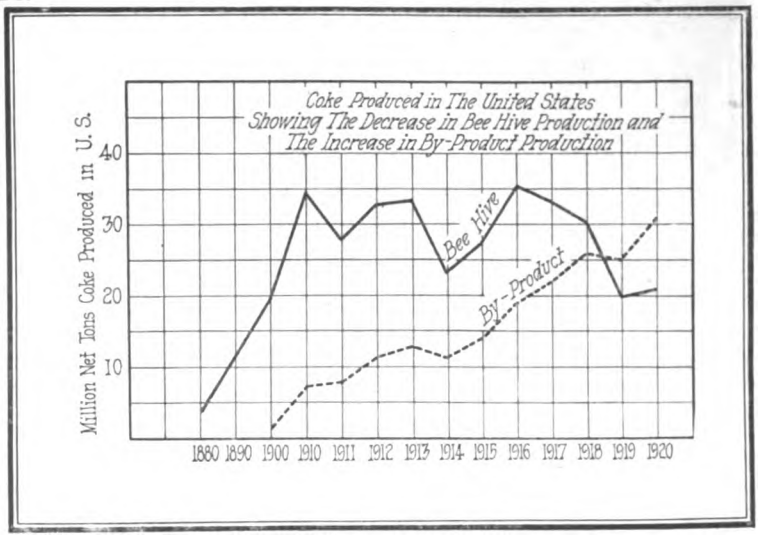
At the right—Producer Gas Plant, where gas is made from coke, to heat the ovens.

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A corner of the electric power house, Seaboard By-Products Coke Co., Kearney, N. J.

Below—Bee-Hive ovens produce coke, but recover none of the valuable by-products. This chart is interesting as showing an important trend toward conservation of our fuel resources.

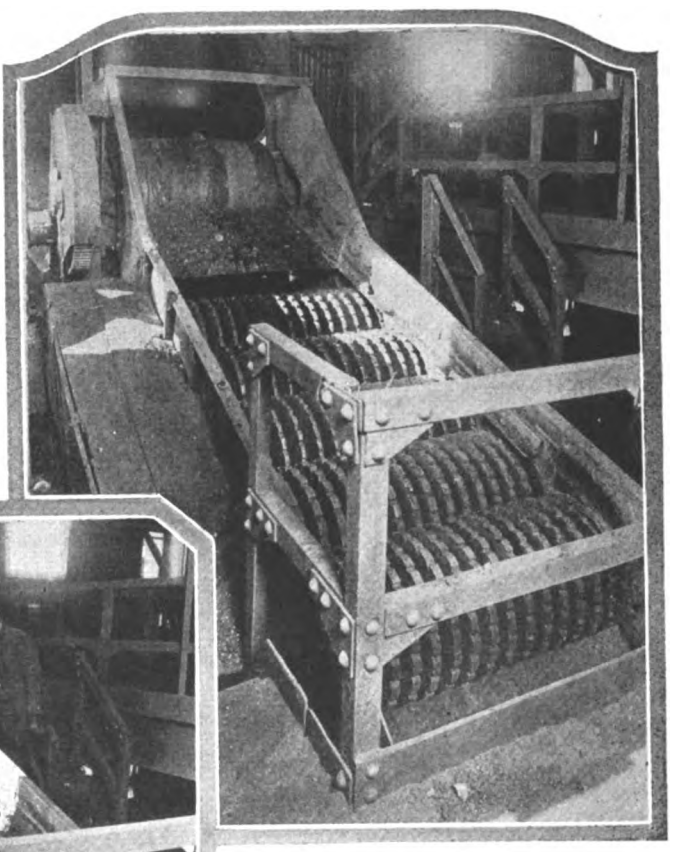


movement; more and cheaper gas for both domestic and industrial heating; more and far cheaper fertilizer (from the ammonium sulphate), with consequent cheapening in the cost of production of foodstuffs; better dyes, explosives and drugs.

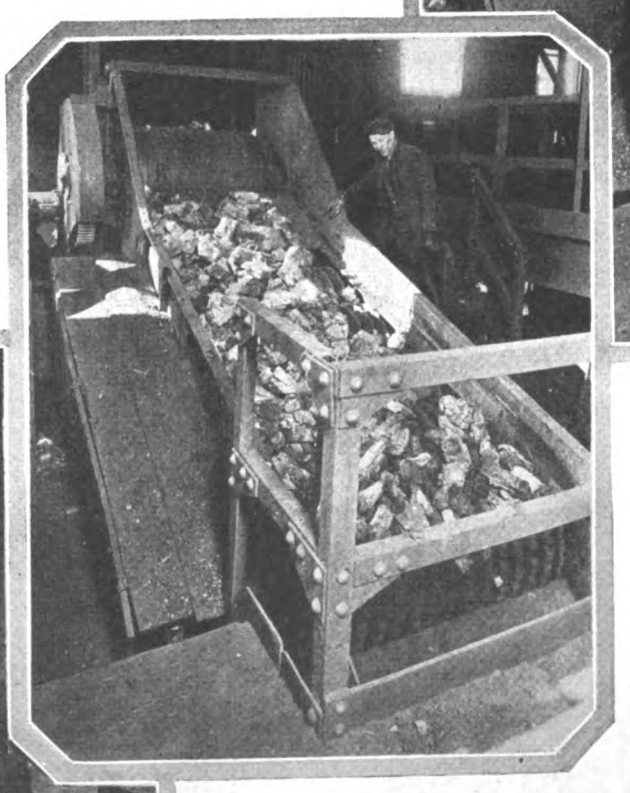
The modern By-Product Coke Plant is in reality a huge chemical laboratory where chemical processes take place on a large commercial scale. It is a modern manufacturing plant where labor is reduced to a minimum and operations are carried on mechanically through the extensive use of electricity.

Following the route of the coal, from which the coke is made, through the modern by-product coke plant we start

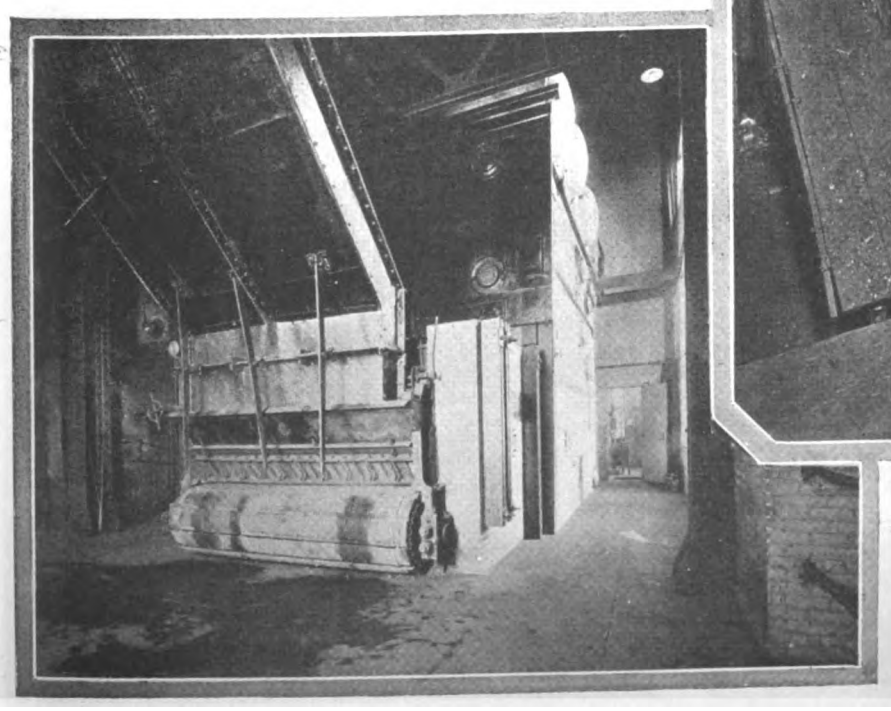
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Rotary Grizzley, which removes the smaller-sized coke from Furnace, Foundry and Water Gas Coke.



Coke passing over the Rotary Disc Grizzlies.

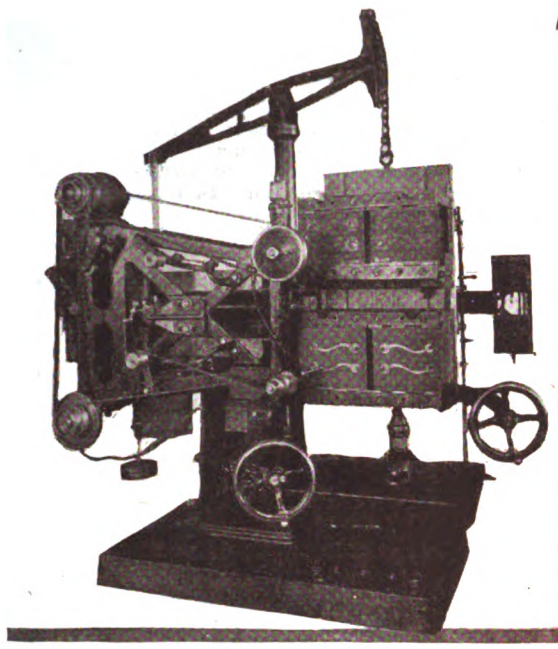


Corner of boiler house, showing automatic stoker for burning Coke Breeze.

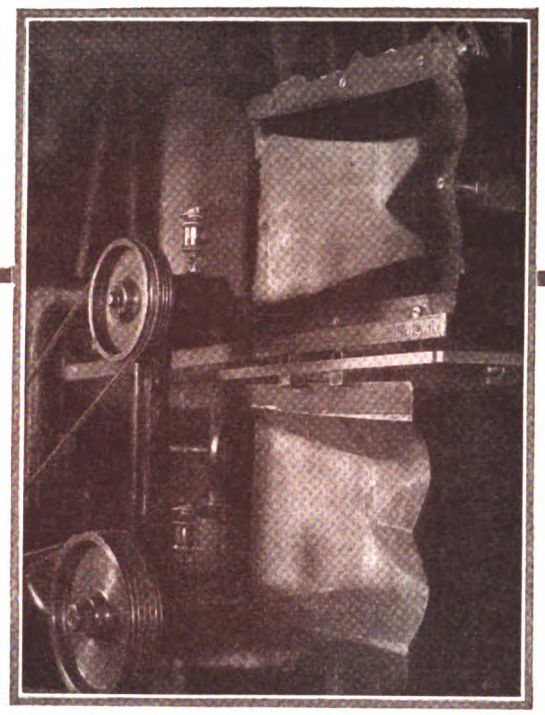
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Turning Craftsmanship

"Do It Mechanically"



Machine Cutting Wrench Dies Automatically in a fraction of the time a skillful man takes to cut by hand.

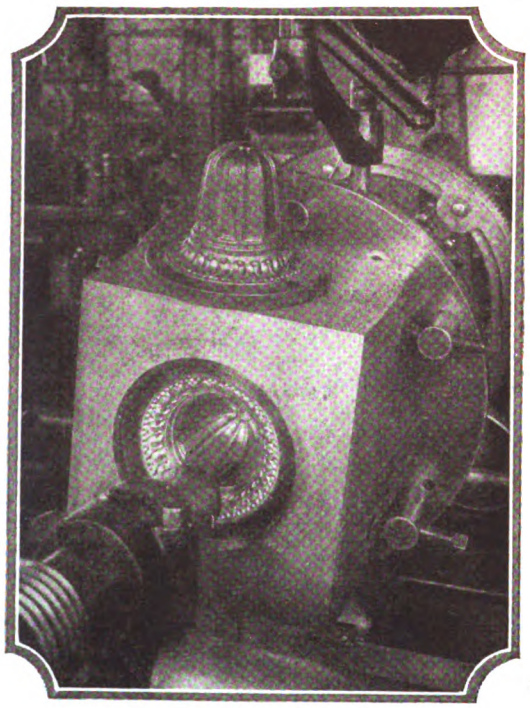


Cutting a shovel die from one side of a sheet metal pattern; the punch is cut from the reverse side—and the two fit!

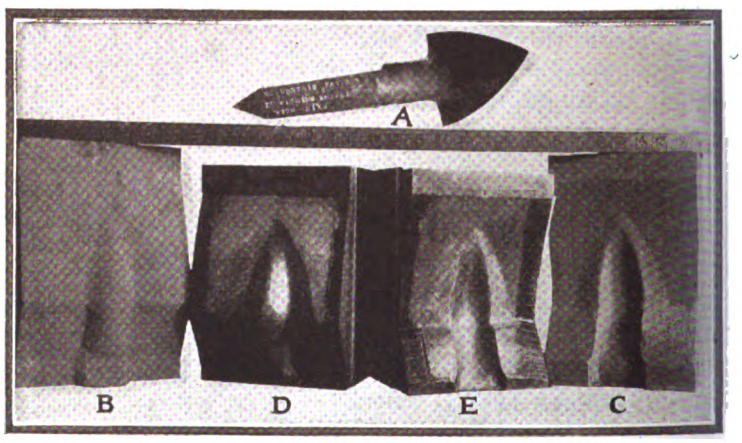
BACK in the early days, when a man wrote a book, each and every copy of that book had to be done by hand. If the book contained illustrations, these too had to be copied by hand, one laboriously executed copy for each additional copy of the book. Today, by means of the two arts—printing and photo engraving—we produce millions of copies of any book, each an exact replica of all the others.

Until recently the art of die-sinking was in the same state of progress as was the art of producing books during the Middle Ages. Products which were to be manufactured in quantities, and which could be either die-cast, molded or drop-forged, require, of course the making of dies or molds; and there was no way to make these except by hand.

Obviously, the making of these molds or dies has been an expensive proposition, in-

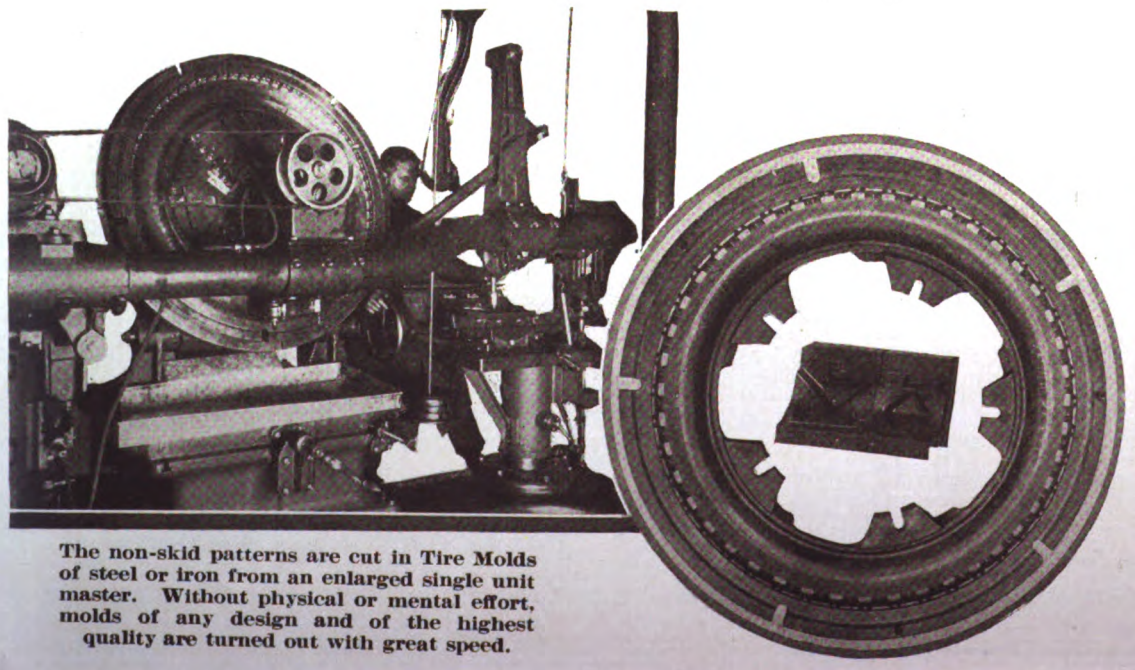


Cutting a die for a lighting fixture part; the part itself being shown on top of the die-block.

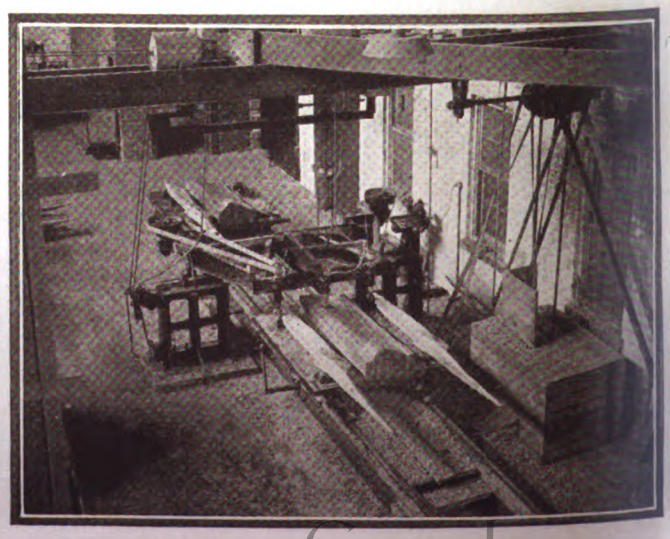


"A" the original sheet metal pattern —"B" and "C" the cement masters cast from the pattern. "D" and "E" the dies which were cut from the cement masters automatically on the electrically controlled machine.

The same principle was mobilized to meet the government's demand for airplane propellers during the war. Again speed and accuracy were the essentials—and the substitution of the automatic machine for rare human skill. Twelve minutes for machining a propeller.



The non-skid patterns are cut in Tire Molds of steel or iron from an enlarged single unit master. Without physical or mental effort, molds of any design and of the highest quality are turned out with great speed.



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into Quantity Production

Applied to the Die-Sinker's Art

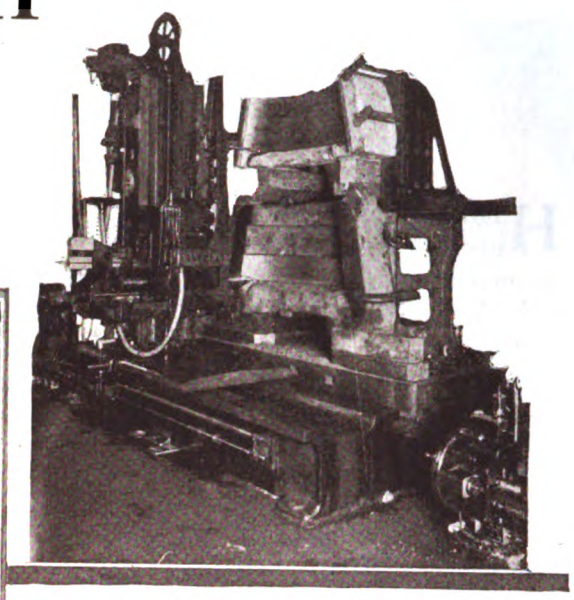
volving the work of highly skilled craftsmen, and requiring an immense amount of time. In fact, to a manufacturer, the phrase "You'll have to have a die made for that" was equivalent to saying "You'll have to spend an immense amount of money."

The machine illustrated on these two pages has done for die-sinking what photo-engraving and printing did for the production of books. Without sacrificing accuracy or quality, it automatically cuts dies (or molds) in a fraction of the time required by hand. Not only does it reproduce existing dies, but with equal facility, the machine will produce dies by means of a pattern taken from the product itself.

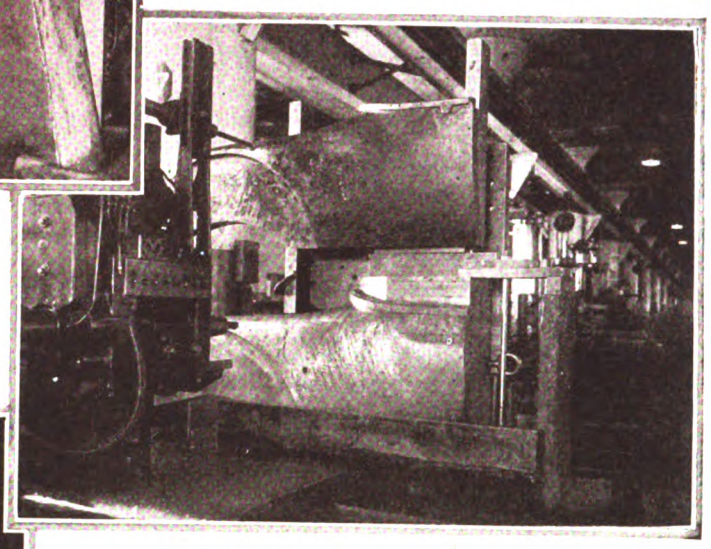
The accompanying illustrations with their captions show, without the need of extended explanation, how this machine accomplishes its work.



The 2" Drilling Cutter plowing its way through the hard casting, faithfully reproducing the plaster pattern. The touch of the tracer is so delicate that the pattern is not marred.



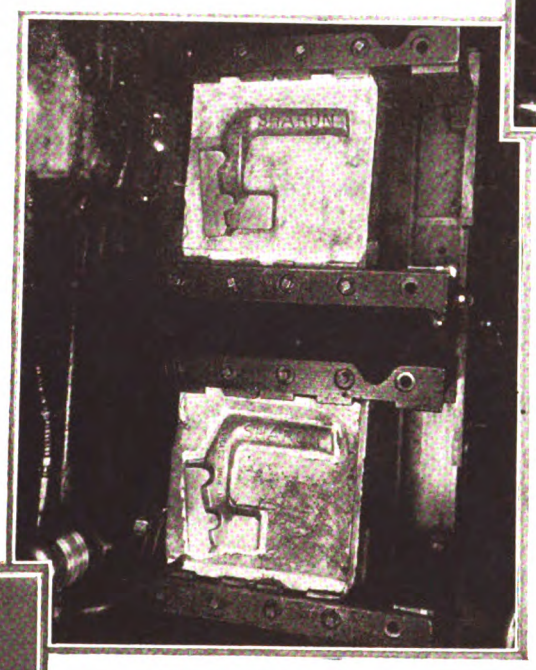
This 44" Cowl die is cut in 20 hours.



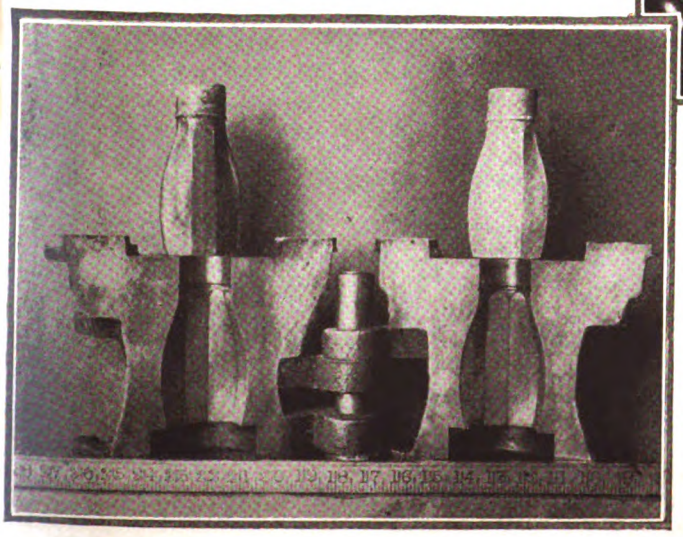
Automobile bodies of pressed metal require enormous dies. This machine saves an incalculable amount of time and labor.



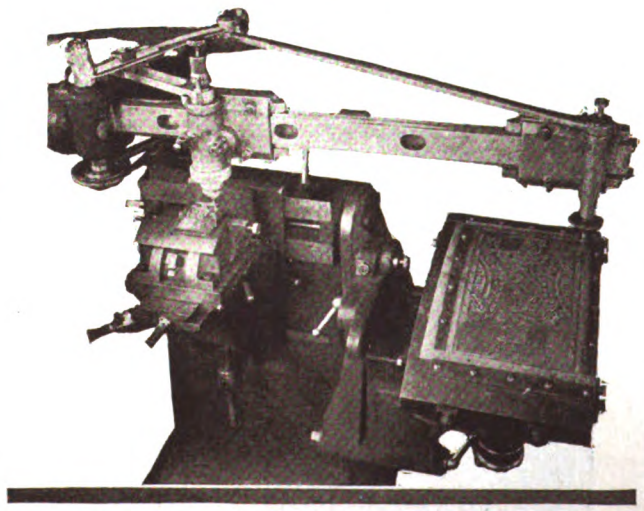
The President's portrait on this Quarter-Century Souvenir Medal was the work of the same machine.



In the foundry, for accurate core molds,
The same process is applicable.



Detail of a set of pickle bottle molds cut automatically in three hours.



A machine for steel plate engraving, substituting the rare skill of the engraver, must be of marvelous sensitiveness. Plates for playing cards must register, lines must be clear, graduations must be delicate. This machine has many kindred applications.

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One of the "Hundred

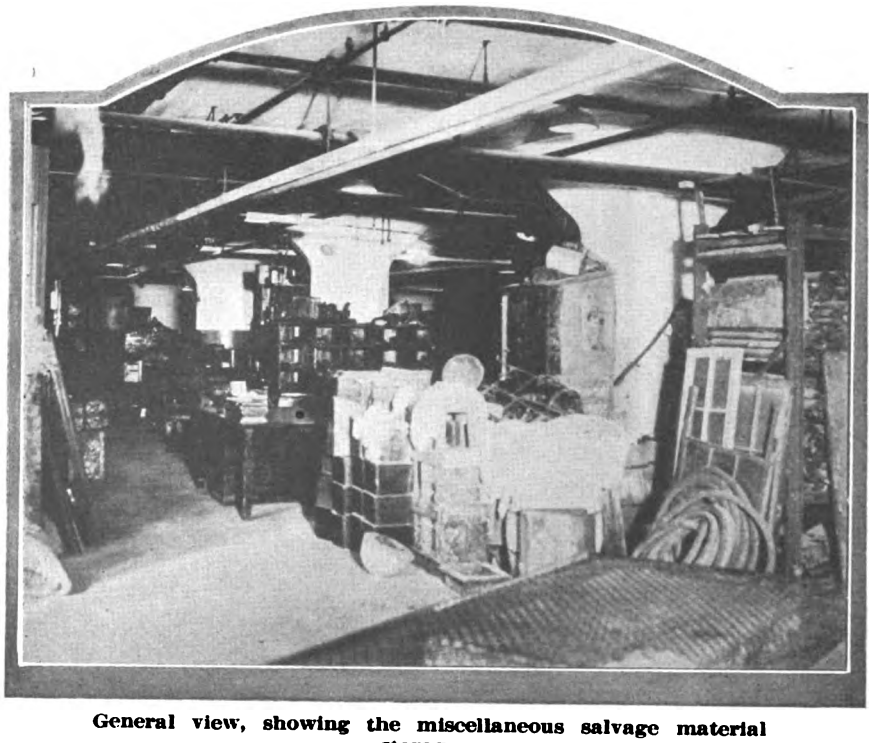
By

Salvage Section,

HERBERT HOOVER, in an address before the American Engineering Council's Annual Meeting at Syracuse made the following statement during his discussion of our great national waste problems:

> " . . . Beyond this again is a wide area of waste in the poor coördination of great industries, the failures in transportation, coal and power supplies which re-echo daily to interrupt the steady operation of industry. There are again such other wastes due to lack of standardization, to speculation, to mismanagement, to inefficient national equipment and a *hundred other causes.*"

We have long since learned that our present Secretary of Commerce is not given to losing himself in generalities. Furthermore, his enthusiasm and thoroughness in suggesting remedies for industrial problems is emphasized throughout his entire treatment of the subject of our national waste. But although we listened with eagerness to derive from his expert knowledge at least a few of the "*One Hundred Other Causes,*" the conference terminated all too soon leaving one thought uppermost in our minds, the realization that neither Mr. Hoover nor any other national figure could instill a desire in the souls of Industrial Executives to economize and reduce waste unless



General view, showing the miscellaneous salvage material storage.

these same executives accept a point of view similar to that of Mr. Hoover's.

Few men know the real meaning of "Salvage." Call it a step toward remedying industrial "Error," "Loss" or "Waste," or give it any other name—we know that too long have many of our men devoted their energy solely to *goods produced*, thereby neglecting to a marked degree *goods not manufactured.* In other words, although practically every concern of national importance has allowed the formation of Salvage or By-Product Departments, the operating heads in most instances have accepted the suggestion for the formation of such an organization to carry on this work, more with the idea of "Keeping Up with the Joneses," to use the homely American expression, rather than because of the realization of the tremendous losses sustained in past years due to the lack of encouragement to salvage and reclamation methods.

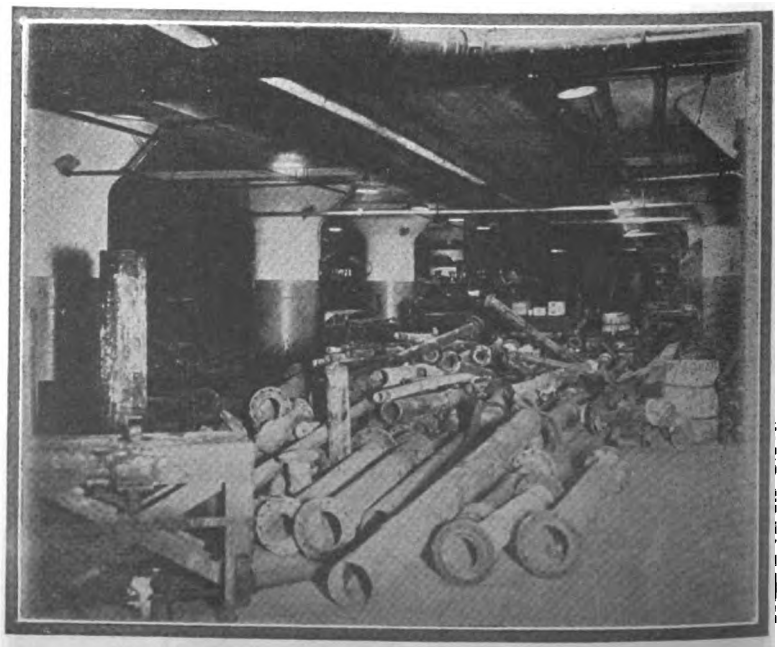
Many executives have not become acquainted with the fact, for instance, that small communities and even cities already are considering the pooling of their industrial wastes, controlling the disposal of same centrally, and in al of same centrally, and in this way saving one of the leaks to have been an easy matter to secure the authority and capital for work of this nature, but the more serious problem now is to sell the idea further to the officials so that it will in time be quite a natural thing for them to utilize the backs of old scrap paper for memoranda, to use their pencils to within more than three inches of the end, and a thousand and one other, what might apparently seem insignificant, ways of reducing waste. This one effect more than any other, will give the desired stimulus to the young departments organized to carry on salvage operations successfully.

Most of us are aware of the valuable work done by the Salvage Section of the War Department in the field during the World War. It might be interesting to note, from an announcement recently made in one of our trade journals, that the Quartermaster Department, realizing its importance, is about to establish a course in Salvage Methods particularly along sorting and reclamation lines.

In many respects the small



Baling presses—rag and paper scrap room. Left-hand press has just finished a bale; right-hand press in operation.



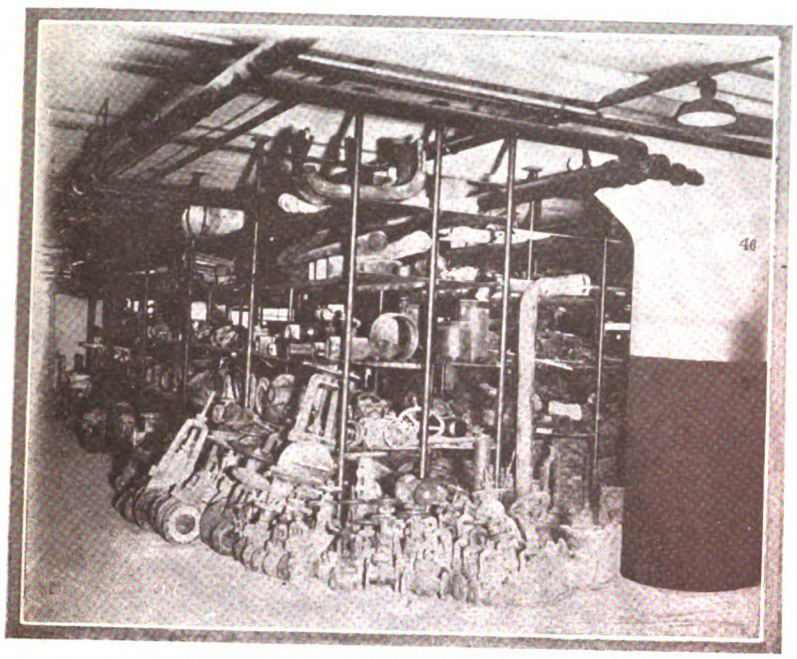
Miscellaneous pipe fittings before sorting. (See upper left-hand illustration on the opposite page.)

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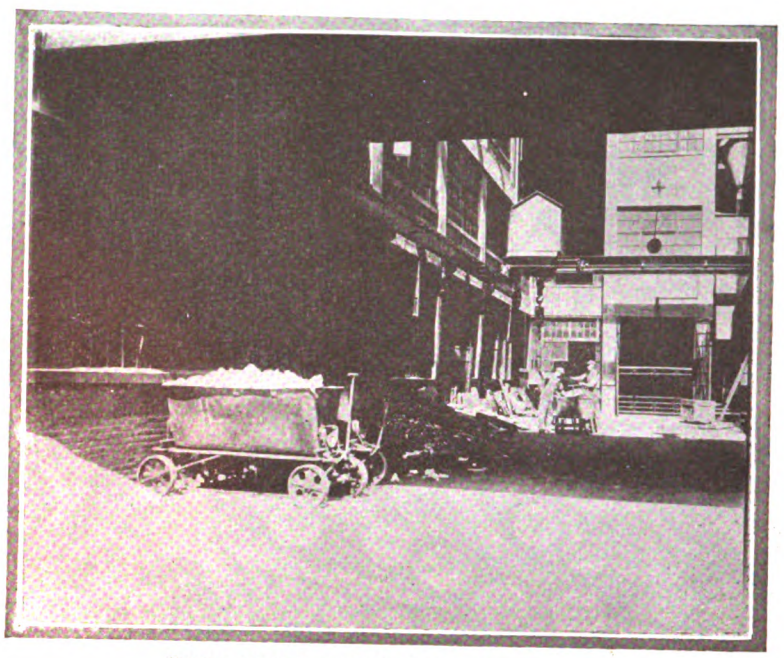
Other Causes"

G. I. LYONS

U. S. Rubber Company



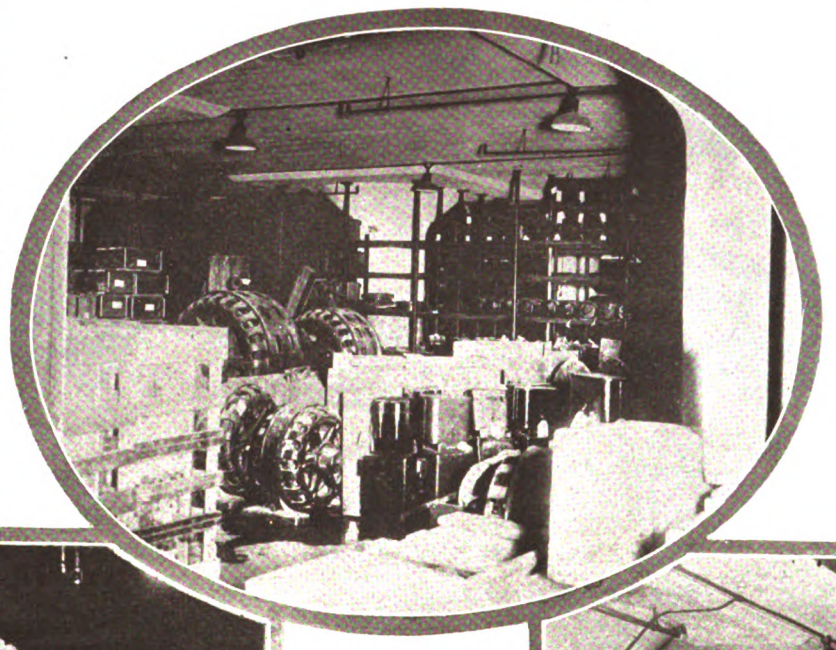
Miscellaneous fittings after sorting and storing in racks.



Scrap metal sorted from shop wagons into different piles before loading into delivery trucks.

concern is not under the same handicap as the big corporation. In the first instance, Mr. Fry asks the Plant Manager to give the necessary authority to scrap or sell a certain unused machine as he feels it is obsolete, taking up valuable space, depreciating on the books and causing a lot of worry and trouble in general. The manager O. K.'s the request and the machine is sold. Corporations having a number of plants are falling in line in the endeavor to make their system as simple a procedure as the above, but because of the intricacies of control, wide scattering of factories controlled by the parent company, diversified line of products, etc., it is a more difficult task to control centrally the transfer and sale of unused equipment and supplies, the making over of obsolete and waste material into By-Products and the reuse or sale of such goods.

Salvaged electrical equipment, ready for emergency service.

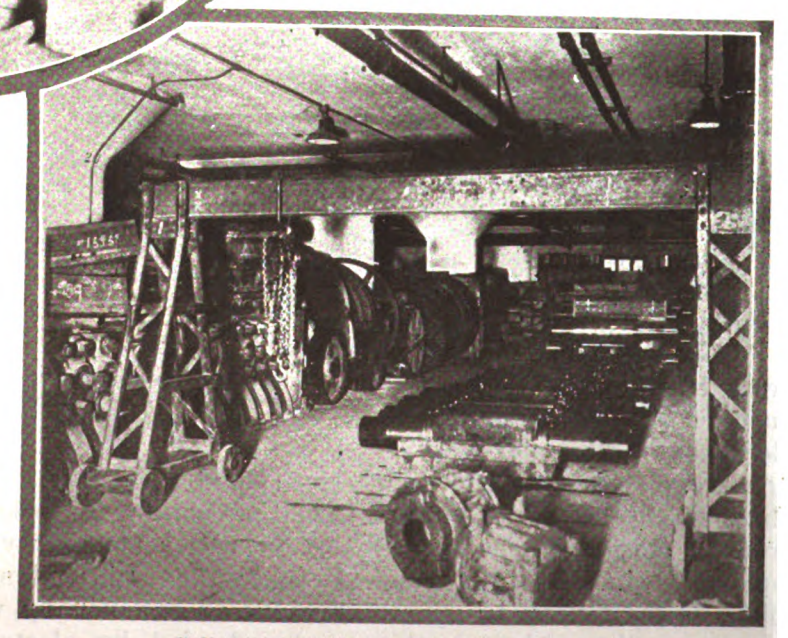


"*Mas vale poca que nada,*" a sound Spanish idiom, gives us the key to the whole Salvage theory. "Little is better than nothing," and the quicker in-

(*Continued on Page 52*)

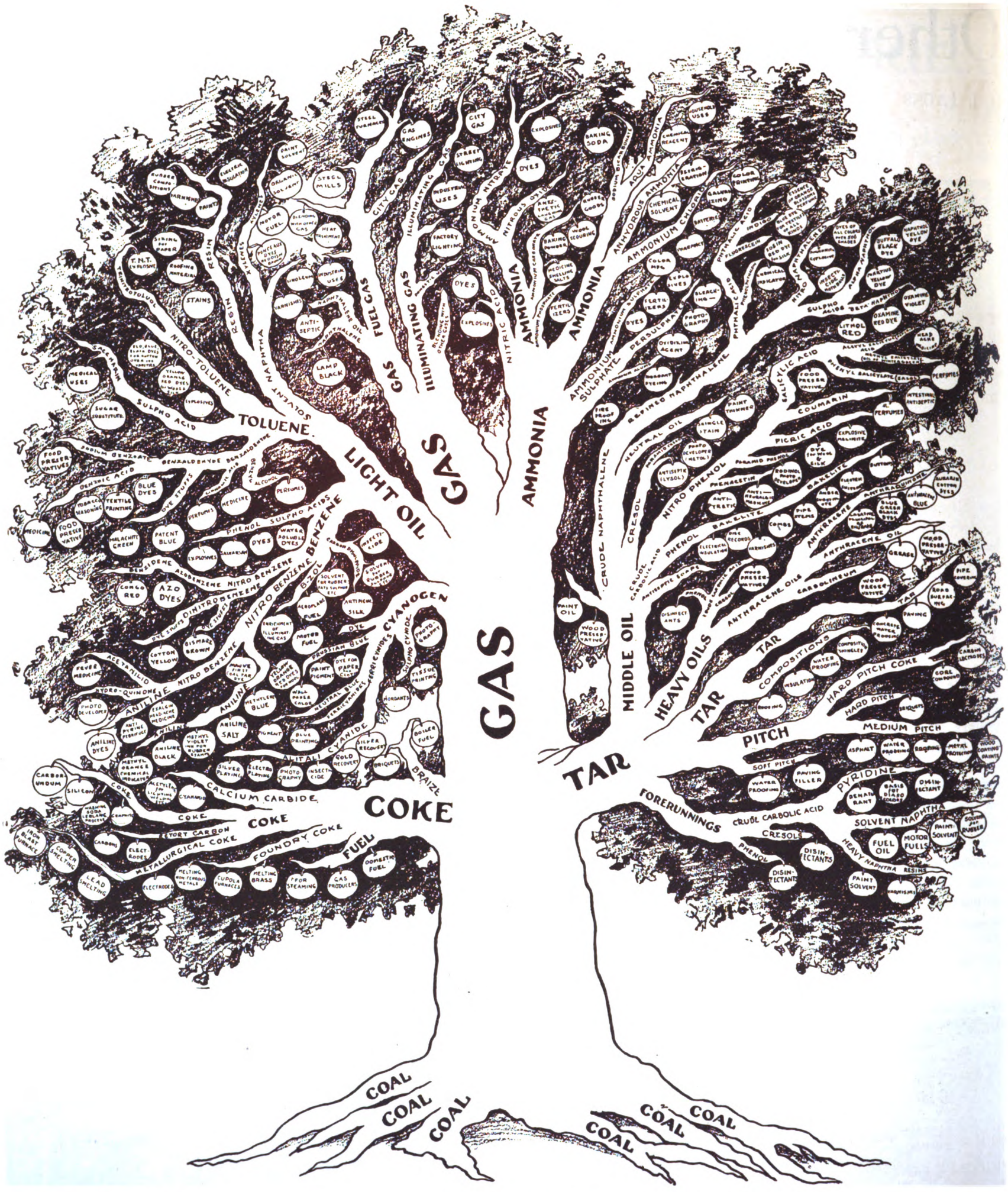


Salvaged steam fitting material, as stored in racks.



Salvaged machinery—note the care used in storing.

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COAL PRODUCTS TREE

Showing the products obtained from coal by carbonization in the modern by-products coke oven. The branches of the tree indicate various materials and the fruits show the use made of the products.

(Continued from Page 19)

with the coal unloading equipment, consisting of large underground hoppers over which the freight cars are run and dumped, the coal being carried away to storage by electrically operated belts. Where the coke plant is located on navigable rivers or the seaboard, this track hopper is used mostly when navigation is blocked by ice, or under emergency conditions; the main volume of coal being received by water and unloaded by electrically operated grab buckets.

It is not possible to weigh in coal over track scales economically when received by water. A remarkable device is therefore used, called a Merrick belt weightometer, which weighs incoming coal on the traveling belt with astonishing accuracy.

After the coal has been weighed in it is carried over electrically operated belts to storage or else direct to the top of the preparing building. In this building are located

(Continued on Page 26)

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Why are these 50 Local business men paid more than this eminent engineer?

THE chief engineer of a 50 million dollar project was discussing the salaries of technical men not long ago.

"There are only half a dozen men in my field who are paid more than I am," he said. "Yet there are fifty men in business, in this little city of 100,000 people, who make very much more money than I do or ever will."

"Why is that true?" he was asked. And he answered:

"The technical man is a specialist in ***one*** *department of modern industrial life. Even when he gets pretty close to the top of the profession, as I have, he is a specialist still. The all-round business man knows enough about* ***every*** *department to make use of the services of specialists. We work for him and he makes a profit on us."*

And he added that the technical man who will make a study of modern business fits himself to be his own employer—to make profits instead of receiving only wages.

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Such a study is possible in spare hours thru the Alexander Hamilton Institute.

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Of this great number more than one-tenth are men of technical training, many of whom are on record in this little book.

The book tells about the relationship of the

Advisory Council

This Council consists of Frank A. Vanderlip, the financier; General Coleman duPont, the well-known business executive; John Hays Hammond, the eminent engineer; Jeremiah W. Jenks, the statistician and economist; and Joseph French Johnson, Dean of the New York University School of Commerce.

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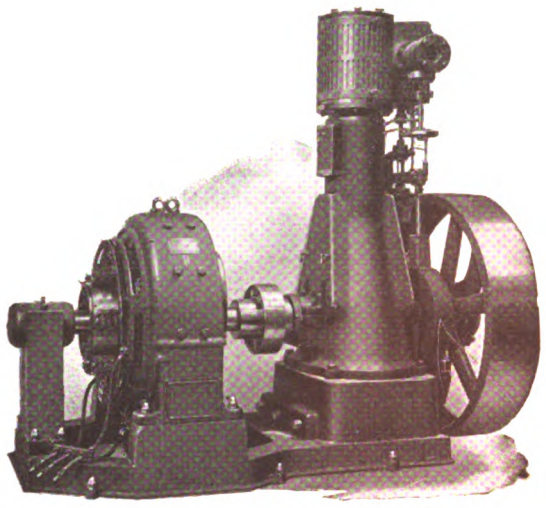
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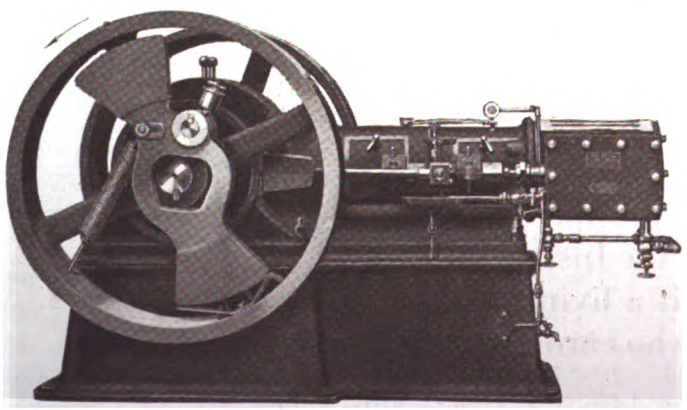
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Saving the Fruit of the "Coal Tree"

(Continued from Page 24)

crushing, mixing and pulverizing units.

The crushers or breakers have a double function: they reduce the coal to the proper size and also remove all foreign matter, such as bone coal, rock, mine car wheels, coupling-pins, bolts, nuts, etc. This refuse is discharged directly into refuse bins and the crushed coal is delivered to mixing bins.

From the mixing bins the coal is delivered through adjustable measuring gates to mixing conveyors. These conveyors deliver at a common point to a proportioning hopper which splits each stream of coal into several equal parts, depending upon the number of hammer mills to be fed. This coal, evenly proportioned and distributed, is fed by gravity to the hammer mills and pulverized, and then carried by belt conveyors to the coal storage bins over the ovens; which latter carry a full day's run of coal.

The necessity for this exact preparation of the coal is readily apparent, for upon this operation depends the "structure" of the coke, a most important element in its physical construction. This mixing process developes a good, hard, "dense" coke with excellent "burning qualities."

The chemical quality of the coke is dependent upon the quality of the coals used. For this reason special attention is given the selection of the coals to be used and because of the by-product plant's location at the consuming market, coals may be selected and drawn from the regions where the best coking coals are mined.

From the coal bin at the ovens the prepared coal is drawn off into electric larry cars, weighed, and carried to the oven, a large horizontal chamber, lined with special silica fire brick. Here it is dropped into the oven and leveled to allow the gases to pass off freely and evenly. All openings are sealed air-tight with clay and the coal is baked, from 18 to 24 hours in the older types of ovens and from 8 to 12 hours in the ovens most recently developed.

The coke ovens themselves are from 37 to 40 feet long, 9 to 11 feet high and 14 to 20 inches average width. Their capacity varies from 9 to 16 tons of prepared coal. These ovens are separated from one another by a series of vertical flues in which fuel gas is burned to provide the heat necessary for coking. Directly under each oven chamber is an air regenerator where the air for combustion in the flues is preheated. In the top of each oven chamber are five openings. One provides an outlet for the gas and the other four are for charging the coal. The doors at each end of the ovens are sealed with clay to prevent leakage of air into oven chambers, provision being made for removing the doors when coking is completed and replacing them after the charge of coke is pushed out.

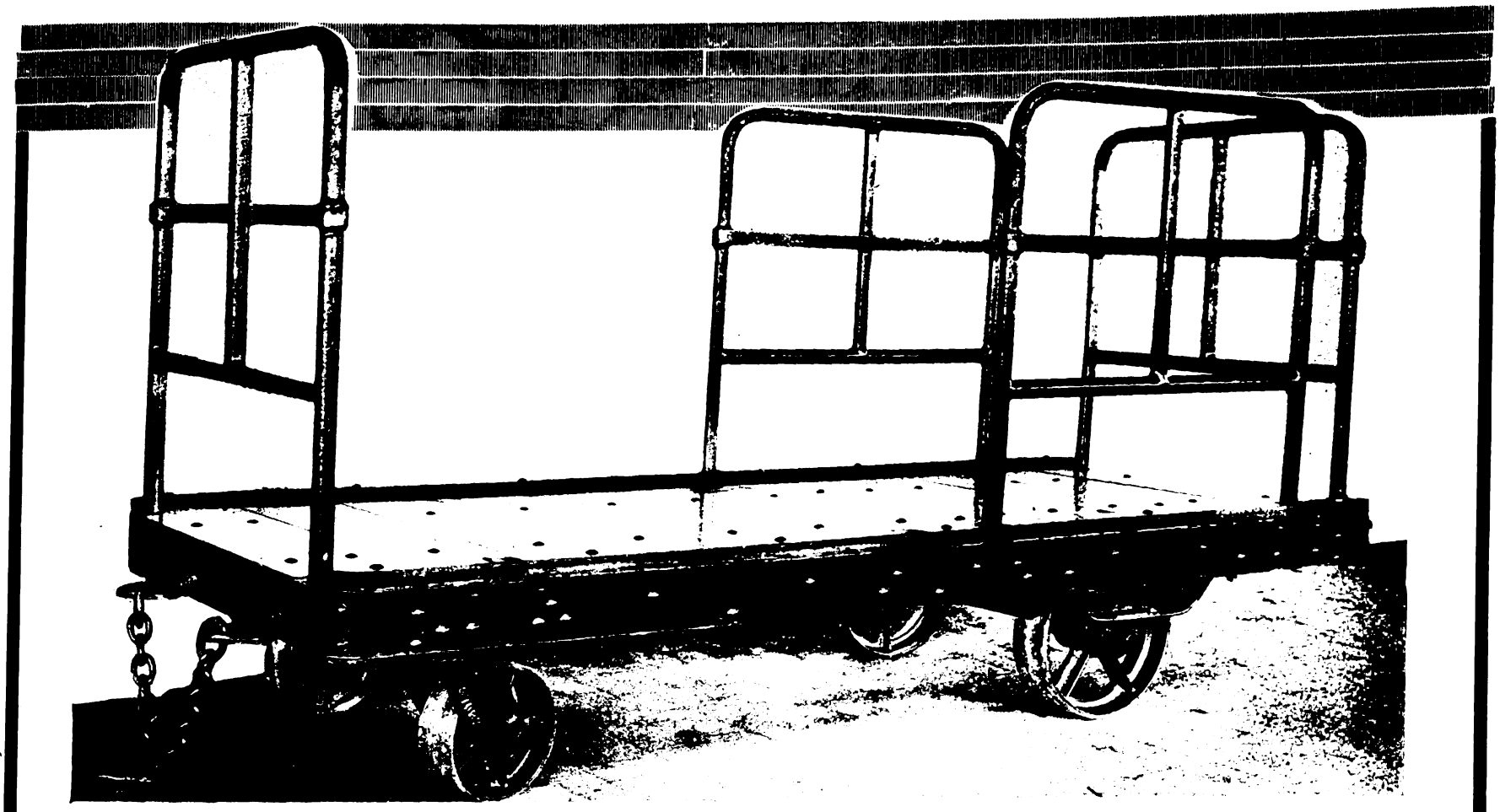
The oven heating gas is obtained in one of three ways: Part of the coal gas recovered from the coking process may be used; Producer gas made from coke may be used; or Blue Gas made from Coke may be used. Any of these three sources of gas supply, or any combination of the three, may be used.

The air for combustion is preheated to a high temperature by being drawn through heated checker brick in the air regenerator. The highly heated air enters the base of the vertical flues and meets the incoming gas which it ignites. The burning gasses pass upward in the flue.

Combustion takes place in the flues along but half the oven length at one time. The hot gases of combustion passing out of the vertical flues travel along the oven in a horizontal flue at the top of the vertical flues. They then pass downward in the vertical flues on the other half of the oven length and into the corresponding regenerator. Here, in traveling out through the brick checkerwork they give up a large part of their heat, to be used later for heating incoming air. The combustion gases then pass into the waste gas flues and the stack. The direction of flow of burning gases through the oven-heating flues is automatically reversed at regular intervals. In this way the regenerators recover and return to the oven heating flues all

(Continued on Page 29)

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It Would Be an Expensive Engine Driver Who'd Use Brakes on a Pull

Yet, that is what you are putting your tractor up against when you operate it with trailer equipment improperly designed for the work. You are forcing it to pull against set brakes. Nor does drawbar pull always vary in direct ratio with the weight of the trailer. Drawbar pull depends upon trailer design. Trailer designing is a specialty today, based on experience.

Buy your trailers of specialists. It is the best economy you can practice. Remember that low tractor operating cost is usually the result of high trailer efficiency.

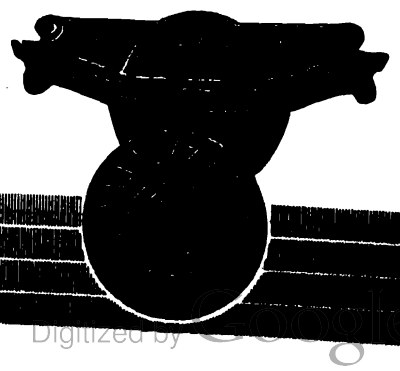
The trailer illustrated is a recent speial "K & J" design worked to meet special conditions. It is applicable, however, to quite a wide range of industrial use. Platform is low, being only 14 inches from floor. The platform is supported on four heavy longitudinal channels tied by channel ends. Trailer built to carry 4000 lbs. Rear wheels on individual axles and with Hyatt Roller Bearings. Caster stem turns on vertical roller bearings with ball bearing swivel and Hyatt Bearings in wheel.

A standard line of "K & J" Trailers, ranging in capacities from one to three tons, is regularly supplied. This line comprises both the all-steel type and the wood platform type. Hyatt Roller Bearings are standard equipment in "K & J" Standard Trailers.

Write for Bulletin 510.

The Kilbourne & Jacobs Mfg. Co., Columbus, O., U.S.A.

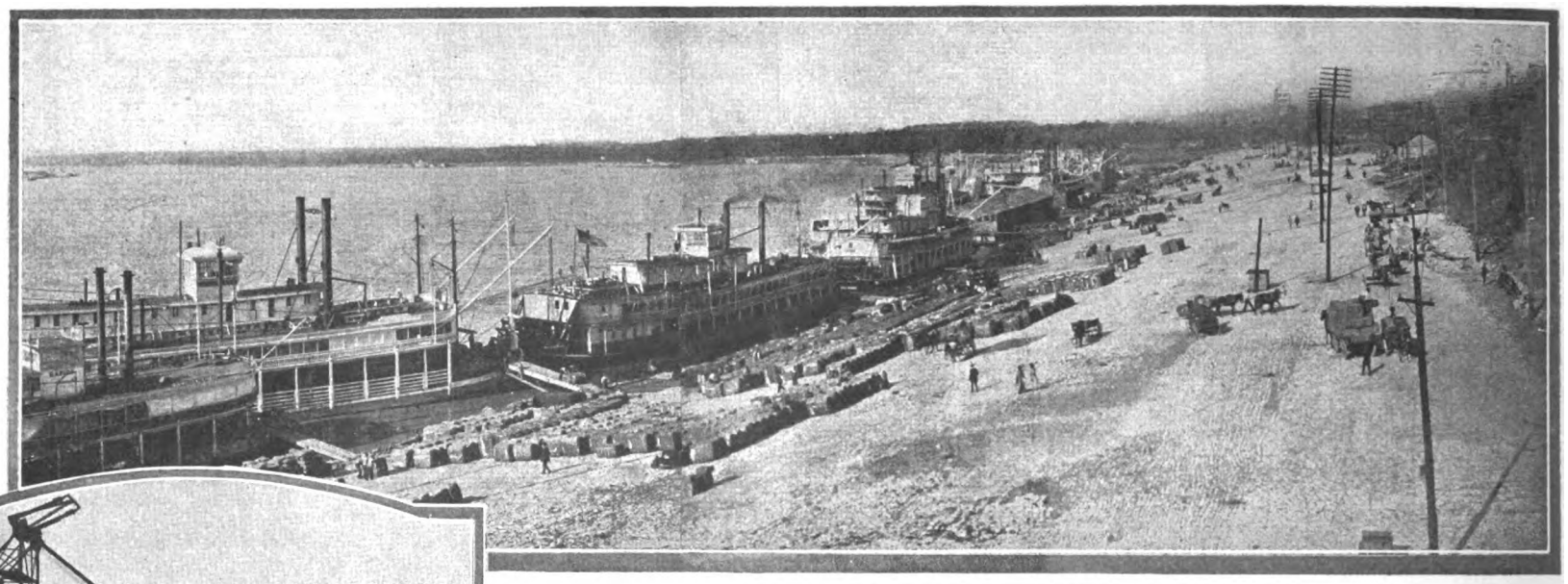
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The Mississippi River Comes Back

BY SAMUEL W. ALLENDER



In the days when Mark Twain was a pilot: showing the old stern wheelers crowded to the levee at Memphis, and the method of handling freight.



One of the two docks recently completed in Saint Louis, showing the new method of transferring freight from the barges to cars.

FOR the last fifty years the principal use for the Mississippi River has been as a source of water supply and sewerage disposal for the towns along the banks of the Mississippi. There was a time when the Mississippi River furnished the principal means of transportation in the Mississippi Valley. That was when steamboats were at the height of their glory. In 1852 three thousand one hundred and forty-nine steamboats docked at Saint Louis.

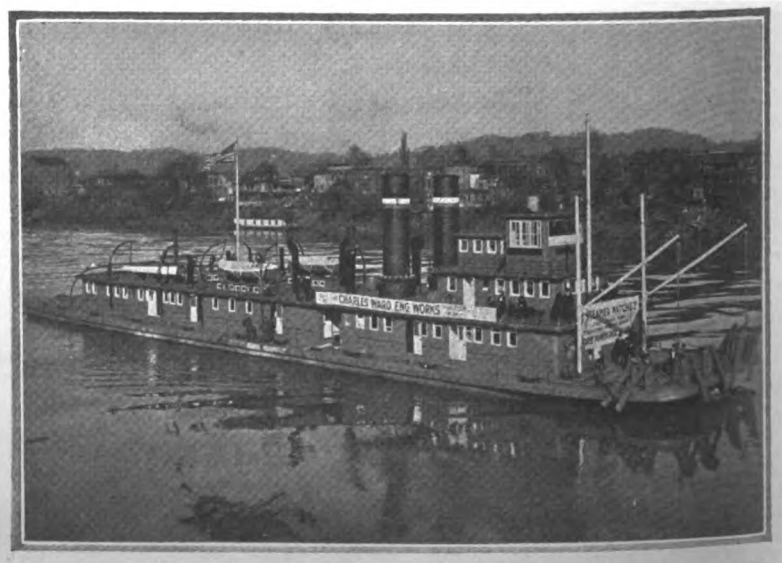
The steamboats disappeared when the steam railroad developed, and in the last fifty years, the industries in the Mississippi Valley have had no means of transportation for raw materials, and finished products, except steam railroads.

During the congestion of railroads, about four years ago, the United States Government, as a war measure, inaugurated a barge line to aid the railroads in moving immense tonnage from the middle west to the seaboard. This line operating between Saint Louis and New Orleans, a distance of about 1100 miles, by river, was continued in operation, and has just recently replaced the emergency equipment with modern

(Continued on Page 32)



A tow of 8 barges loaded with 15,000 tons of freight, passing Memphis.



"Tunnel-type" oil burning tow-boat recently put in service; not built to carry freight, as were the old steamboats, but to tow freight.

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(Continued from Page 26)

heat except that required to produce the necessary stack draft.

During the coking process the hot gases are drawn through mains from the ovens to the primary coolers. These coolers condense tar, napthalene and water vapors. The gas is then drawn into exhausters and driven by them through tar extractors where any remaining tar is removed.

From tar extractors the gas passes through reheaters to the saturators where the ammonia is removed in the form of ammonium sulphate. The ammonium sulphate so formed is lifted to a drain table by means of an air ejector and then dumped into centrifugal dryers. After being dried, the ammonium salt is transferred to the storage pile in the shipping room, where it may be kept indefinitely without deterioration.

The tar, obtained as described above, is shipped in tank cars or tank steamers to refineries where it is converted into its various commercial products. The ammonium sulphate is shipped by box car, truck or lighter, either in bulk or in burlap bags. It is a finished product—valuable as a fertilizer, due to its high nitrogen contents. The gas leaving the By-Product Building is ready for use in heating the ovens or may be further washed by absorbent oil to recover Toluol, Benzol, etc.

If the gas is to be used for municipal purposes it is necessary to purify it further before it is suitable for domestic and industrial use.

To return to the main product, the Coke, which at the end of the coking period has had practically all volatiles driven off by this process of distillation, is pushed from the oven by the pushing machine, a powerful electric ram. The charge is received red hot by the quenching car and carried under a water shower, where it is quenched. After being quenched the coke is delivered to the coke wharf, where the heat still remaining in the coke soon dries it off. The coke, in the mean time cools off so that it may be fed onto a belt conveyor and carried to the screening station.

At the screening station the "Run of Oven" Coke is sized in accordance with the coke plant's market. Where domestice sizes are required (and the domestic demand for good By-Product Coke is increasing with great rapidity) the coke first passes over rotary disc grizzlies. Here the foundry, Furnace and Water-Gas sizes of Coke are separated from the smaller sizes. The former are carried by belts to cars, trucks or barges and the latter go on to the domestic screening station. At the domestic screening station the smaller sizes are separated into regular Egg, Stove, Nut, Pea and Braize Coke. These sizes are stored in large bins until shipped in barges, cars and trucks.

Besides the regular equipment required to actually manufacture Coke and its various By-Products a complete testing laboratory, both chemical and physical is maintained. All coal received and all coke and By-Products shipped must be tested. This means a staff of expert chemical engineers always on the alert to see that everything received and shipped is exactly as it should be. A complete By-Product Coke plant also includes a transformer and electric substation, a water pumping station, machine shop, small gas holders, etc.

Originally, coke was produced to meet the demands of blast furnaces, and the only object was the securing of coke —the by-products being allowed to pass off as smoke. By 1893, this country was producing nine and a half million tons of coke, entirely in what are known as "Bee-hive" ovens. In that year, the first by-product ovens in America were built. However, it was not until we faced the war demands for explosives, nitrates, dyestuffs and drugs—from which non-intercourse with Germany cut us off—that the by-product ovens really began to relegate the Bee-hive ovens to their proper place. For the year 1921, United States Geological Survey estimates show a Bee-hive Oven Coke production of only 5,561,000 net tons, as against a production of 19,918,000 net tons in By-Product Ovens.

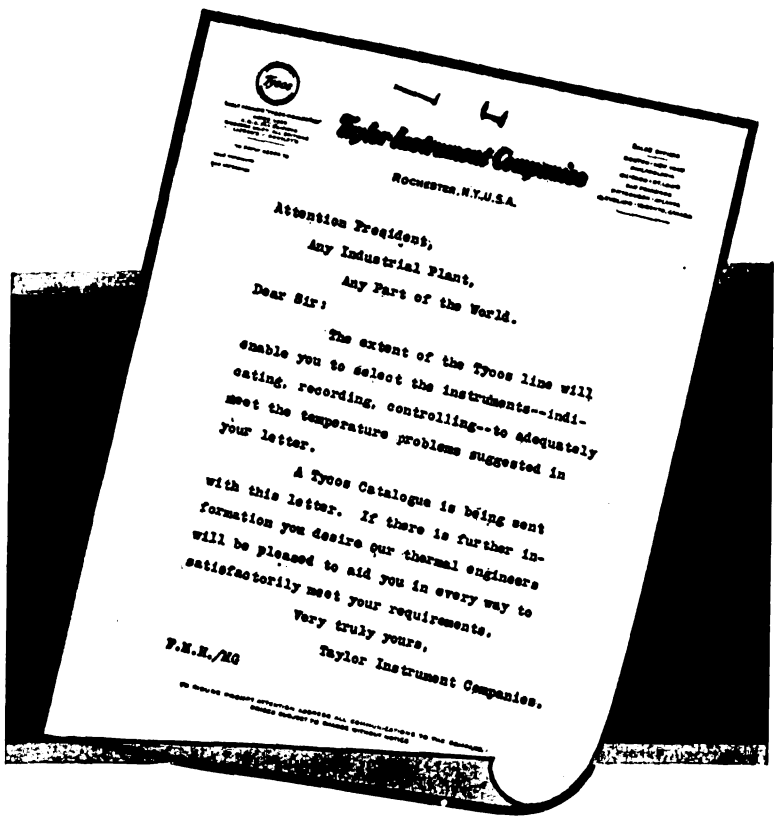
When the day comes that it is made a criminal offense to burn bituminous coal as a raw fuel; when domestic consumers

(Continued on Page 32)

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Announcement

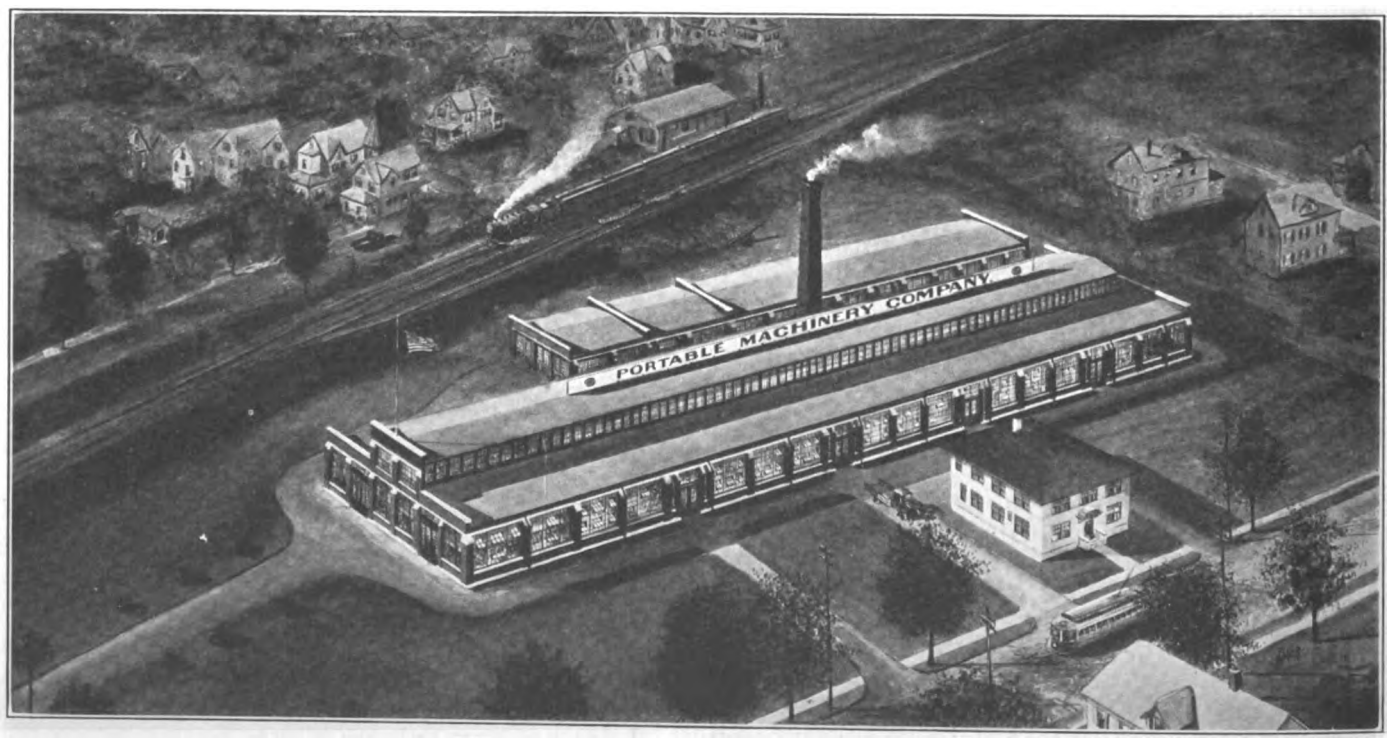
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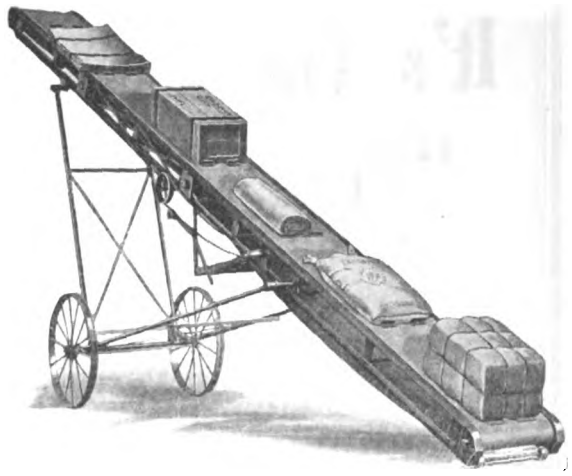
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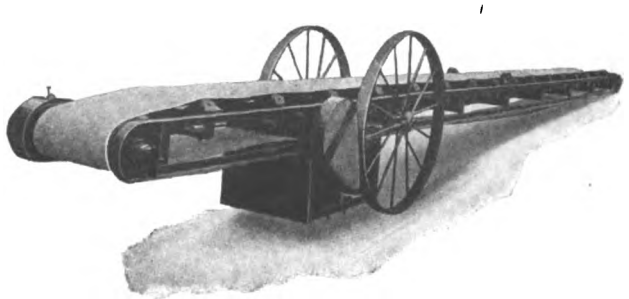


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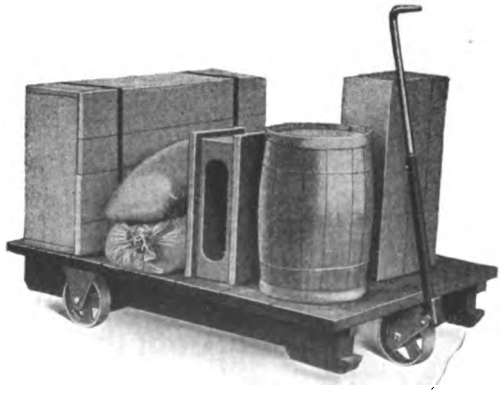
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Saving the Fruit of the "Coal Tree"

(Continued from Page 29)

become educated to the use of coke, not only instead of bituminous, but as a substitute for the dwindling and high-priced anthracite; then perhaps this figure of roughly twenty million tons of by-product coke will seem insignificant—because at present only about one-twelfth of our annual bituminous coal consumption is being subjected to by-product recovery. In round numbers, half a billion tons of bituminous coal are being burned as raw fuel this year—$680,000,000 in recoverable by-products going up our chimneys in this year of economy, 1922!

The Mississippi River Comes Back

(Continued from Page 28)

equipment, including tow-boats, barges and dock facilities. This barge line, operated by the War Department, has demonstrated the great economy and feasibility of water transportation on the Mississippi, and is operating at a profit and with a saving to shippers at a 20% differential under the railroad rates. It is handling a capacity business even though there is said to be a general business depression.

The reason this barge line has been a success, while the old river steamboats could not complete with the railroad, is because entirely different methods are used in handling freight. The old river steamboat had a carrying capacity of about thirty ton, or an equivalent of one freight car capacity. The Federal Barge Line with one of its powerful tow-boats will tow 15,000 tons of freight in a fleet of eight or ten barges, or an equivalent of fifteen freight trains; more freight in one trip than could be loaded on all the steamboats that docked in Saint Louis in any year when the steamboats had their day. In the old steamboat days the freight was handled by manual labor, and simply dumped off on the levee and the owner told to come and get it. With the present methods, immense docks equipped with freight handling machinery are in use, and the freight is transferred from barges to freight cars and the cars placed in the industry; thru bill of lading being issued to and from the shipper's warehouse door. Also, through rail and water rates are published to points hundreds of miles from the river, and industries inland hundreds of miles away from the river bank enjoy the same saving in cents per 100 lbs. as does the shipper located on the banks of the river, between Saint Louis and New Orleans. Chicago furnishes more freight to the barge line than does any city in the country, although it is three hundred miles from the northern terminal of the line. Saint Louis is able to ship via all water to all the ports in the world. In August last year the Barge line handled more than one and one half million bushels of grain, for export.

The tow-boats in use are the most powerful tow-boats in use in the world, are oil burners and are propelled by a screw which operates in a "tunnel," in the center of the boat, thus permitting the tow-boat to operate in shallow channels. The barges are of two thousand ton capacity and built entirely of steel. The trip between Saint Louis and New Orleans is made in six days down stream and twelve days up stream, permitting the barge line to compete with the railroads in the matter of time. The tow-boats are equipped with wireless and are in communication with terminal points at all times. The saving of 20% under the rail rates, attracts all the business that the barge line, in full operation, can handle. The service, now in its fourth year, has demonstrated that there is channel enough in the river to operate successfully, and that it can handle freight for 20% less than the railroads, at a profit. In five months of last year, from April to Octo-

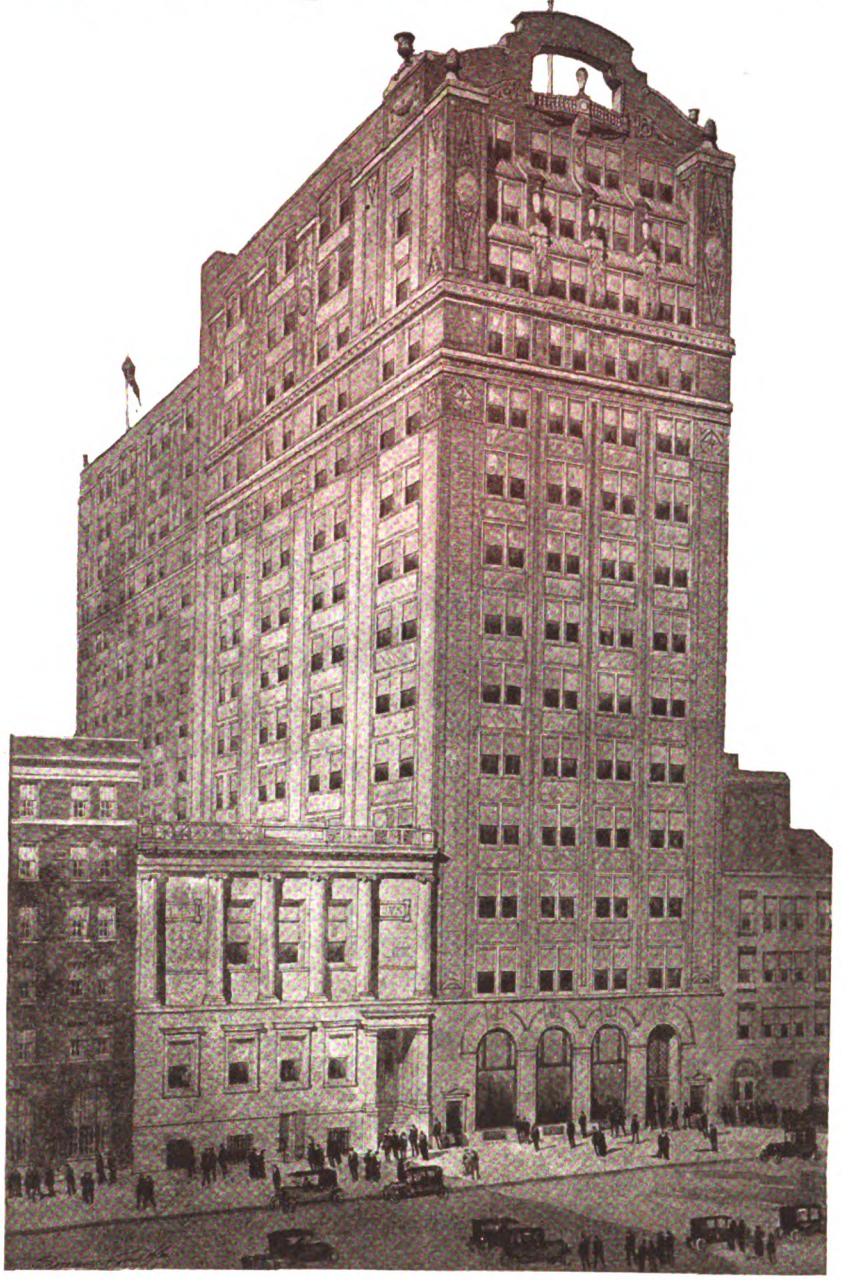
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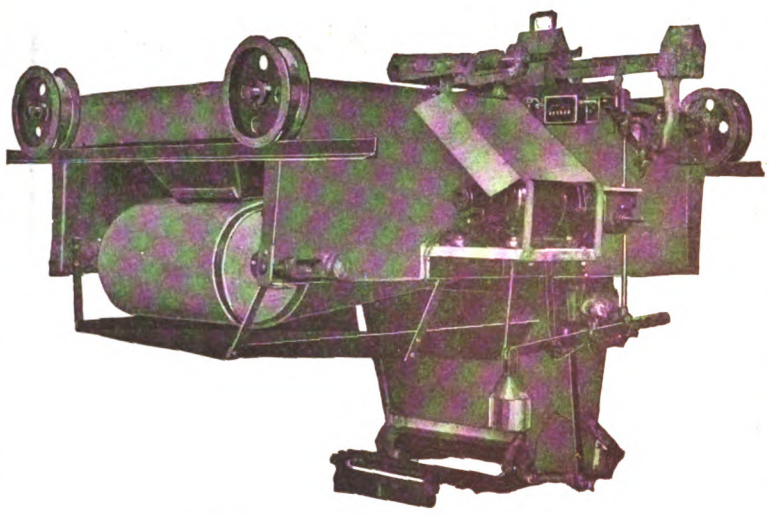
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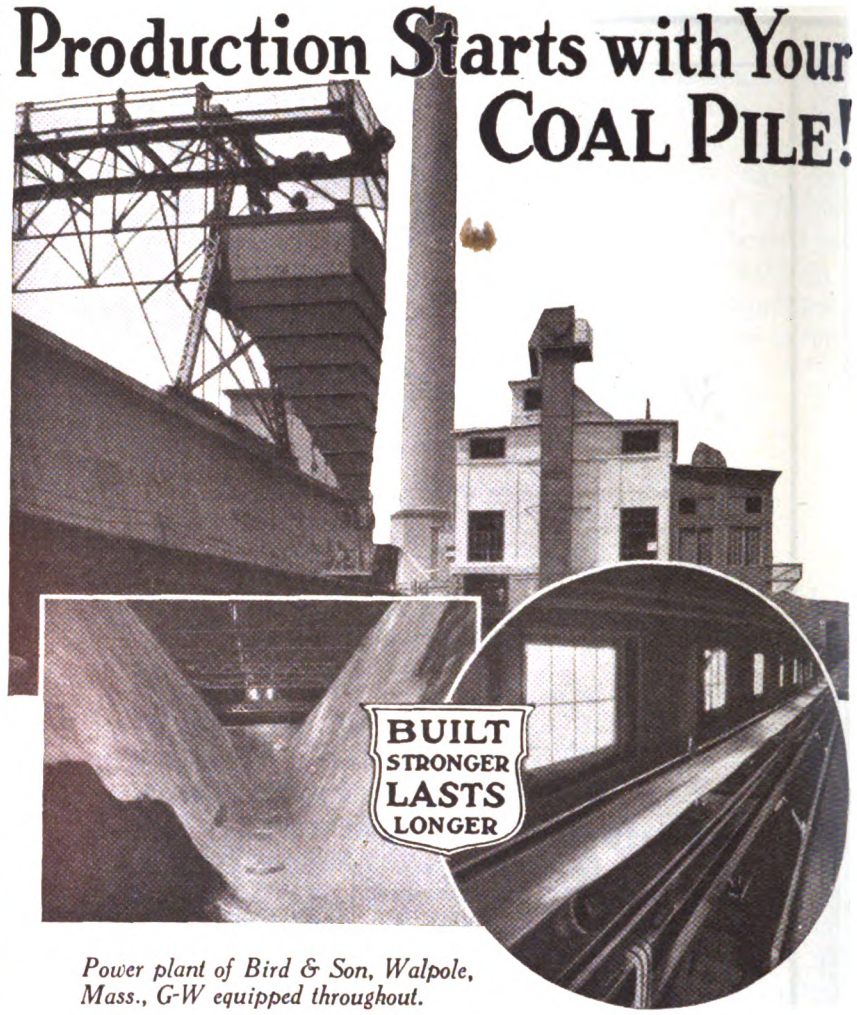
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Gifford-Wood Co.
MATERIAL HANDLING EQUIPMENT

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(Continued from Page 32)

ber, the Government barge line on the Mississippi earned $257,000.00 more than its operating expenses. It has the distinction of being the only war venture of the Government that has made money as a business enterprise.

The Government has announced its intention to sell the line just as soon as conditions are favorable for disposing of it to best advantage. However, the people of the Mississippi Valley hope that it will continue to function when sold to private interests, and continue to grow in size. For, although the line has been a successful demonstration, it is still in its infancy and is only more economical water transportation. transable to handle a small percentage of the freight seeking the

The Aladdin's Lamp of Science

(Continued from Page 10)

for electrons to leave a wire, pass across a gap (devoid even of air and other gases) and to be collected again upon another wire which may be joined to the first.

Consider the simple vacuum tube shown in Figure 1. It consists of a glass bulb similar to the ordinary incandescent lamp, and besides a filament it also contains a little metal plate placed near the filament. Now an *incadescent* filament when in a vacuum spontaneously emits electrons. Such an incandescent filament is not the only thing which will emit them. They are a by-product, for instance, of many radio active transformations—being shot out from the disrupting atoms with tremendous velocity—and under the proper circumstances they are also emitted from a clean metal surface when a beam of light is incident upon it. Electrons produced by the action of light are known as "photo electrons," those produced by the action of heat, as in the case of the incandescent filament, are called "thermal electrons," or sometimes "thermions" for short. Hence the term "thermionic vacuum tube."

Returning to the tube shown in Figure 1. When the filament is heated by some external source of electric power—as in the ordinary electric incandescent lamp—it spontaneously emits electrons into the evacuated space within the glass bulb. These liberated electrons are free to move in any direction and if a positive potential is applied to the neighboring metal plate they will be attracted to it. Thus, by joining the negative pole of a battery to the filament and the positive pole to the plate, a steady flow of electrons can be obtained through the vacuum tube and around the external circuit through the battery. This operation will continue indefinitely, the only requirement being that the filament remain hot. When the filament is cold it is quite impossible to make a current flow through the evacuated space within the tube.

The emission of electricity from an incandescent filament was first observed by Thomas A. Edison when making experiments with some of his incandescent lamps in the early days of the electric light. Although Edison took out patents on his device he did not develop it to such a point that it had any practical applications. These applications have come to light only during recent years and largely as a result of the coordination of many diverse and highly involved researches.

To Dr. Lee deForest belongs the credit of having introduced the modification which began this series of researches. To the casual observer there is very little difference between the termionic tube of Edison and deForest's tube. Picturing to ourselves the Edison relay with its bulb containing a filament and plate, deForest's modification consists simply of the insertion of a mesh or grid of fine wire between the filament and plate (see Figure 2). This grid is so located that the electrons as they travel from the filament to the plate must pass through

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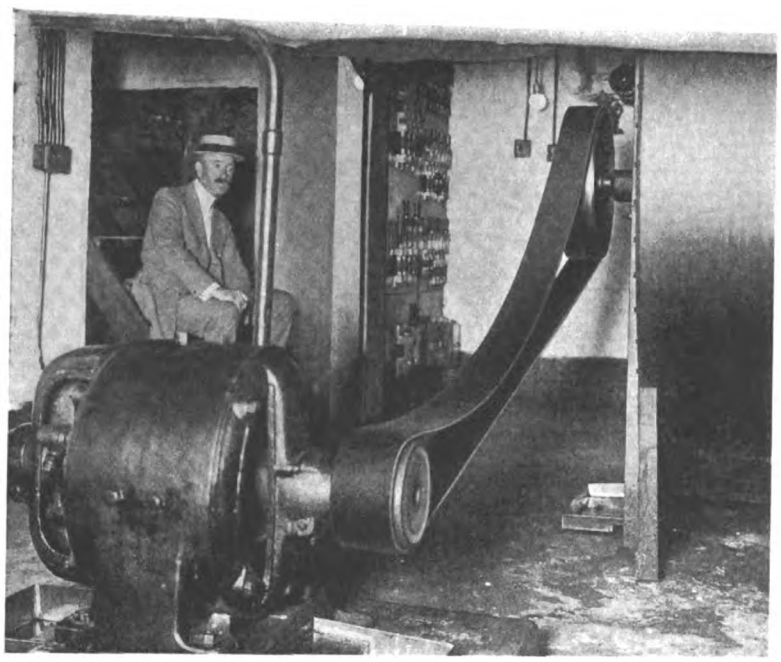
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its meshes.

What is the result of this simple modification? It is so far reaching that it would take chapters to fully describe it, but a simple analogy will help us. By putting this grid between the filament and plate deForest did for the electric circuit what a person would do were he to attach a faucet to the open end of a water pipe out of which a stream is flowing. The Edison vacuum tube without a grid provided no means of varying the current passing through it, just as the open water pipe provides no means of regulating the flow of water. By attaching a faucet or valve to the water pipe it becomes possible to regulate the flow of water by infinitesimal steps by simply turing the valve. Indeed, with a suitably constructed valve a man can very readily, with the expenditure of no more energy than he uses to place his hat on his head, control the flow of a stream of water that is carrying thousands of horse power.

And the details of this analogy may be carried over to the deForest tube. Since the electrons, in moving across the evacuated space between the filament and plate, have to pass through the grid it follows that variations in the electric potential of the grid will control the number of electrons which pass through the grid and therefore the current which the tube carries. In a word, the tube is an electric valve, and just as the valve in the water main allows an attendant, single-handed, to control thousands of horse power, so the deForest valve allows a small electric current to control another current many times as large (see Figure 3). Because of this property the tube is frequently referred to as an "amplifier" or a "thermionic amplifier" or a "vacuum tube amplifier."

To follow this amplifying action in a little more detail, imagine a telephone receiver and battery connected by wires to the filament and plate of a thermionic amplifier as shown in Figure 2.

If the filament is heated to incandescence by an auxiliary source of current, electrons will be emitted from it and produce a steady flow of current through the telephone receiver. Of course such a steady current will not produce any sound in the receiver. Imagine next that a telephone line is joined to the grid and the filament as shown and that a very faint voice current is flowing over this line. The effect of the voice current is to vary the electric potential of the grid by small and extremely rapid fluctuations. The grid in turn induces upon the electron stream flowing through it to the plate exactly the same fluctuations but many times larger. Therefore, the current through the telephone receiver is no longer steady but carries exactly the same fluctuations as those of the current in the incoming line but magnified many times. The response in the receiver is therefore much louder than could be obtained by connecting the receiver directly to the telephone line.

This is an extremely simple and indeed hypothetical instance of the use of the thermionic amplifier but it illustrates its principle of operation, and practically all of the many uses to which the vacuum tube is put, when analyzed, can be reduced to this extremely simple amplifying process.

One of the most important uses to which the vacuum tube is put by the radio engineer is to generate the high frequency waves which are radiated from the transmitting antenna and which travel out in all directions over the surface of the earth to be picked up by one or 50,000 receiving stations as the case may be. In order to generate electric waves of sufficient intensity to travel long distances the thermionic tubes employed must be very large and capable of carrying large currents. The perfecting of such tubes has involved a decade or more of researches and the story is still in its first chapter. There is perhaps no single device on the horizon of the electrical engineer's vision which holds out so many interesting and important possibilities as the high power thermionic tube. As time goes on it will undoubtedly be applied in many ways still undreamed of and may indeed become as familiar to the layman as the electric motor is today.

Brief though it is to date, the story of the tube's development already reads like a fairy tale. As it came from the hand of

(Continued on Page 38)

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What Are *Your* Foremen Doing to Bring Down Costs?

The clipping gives two examples of savings effected by foremen who were trained to do some constructive thinking.

In the one case, hundreds of dollars saved annually—in the other, an increase of 43% in production.

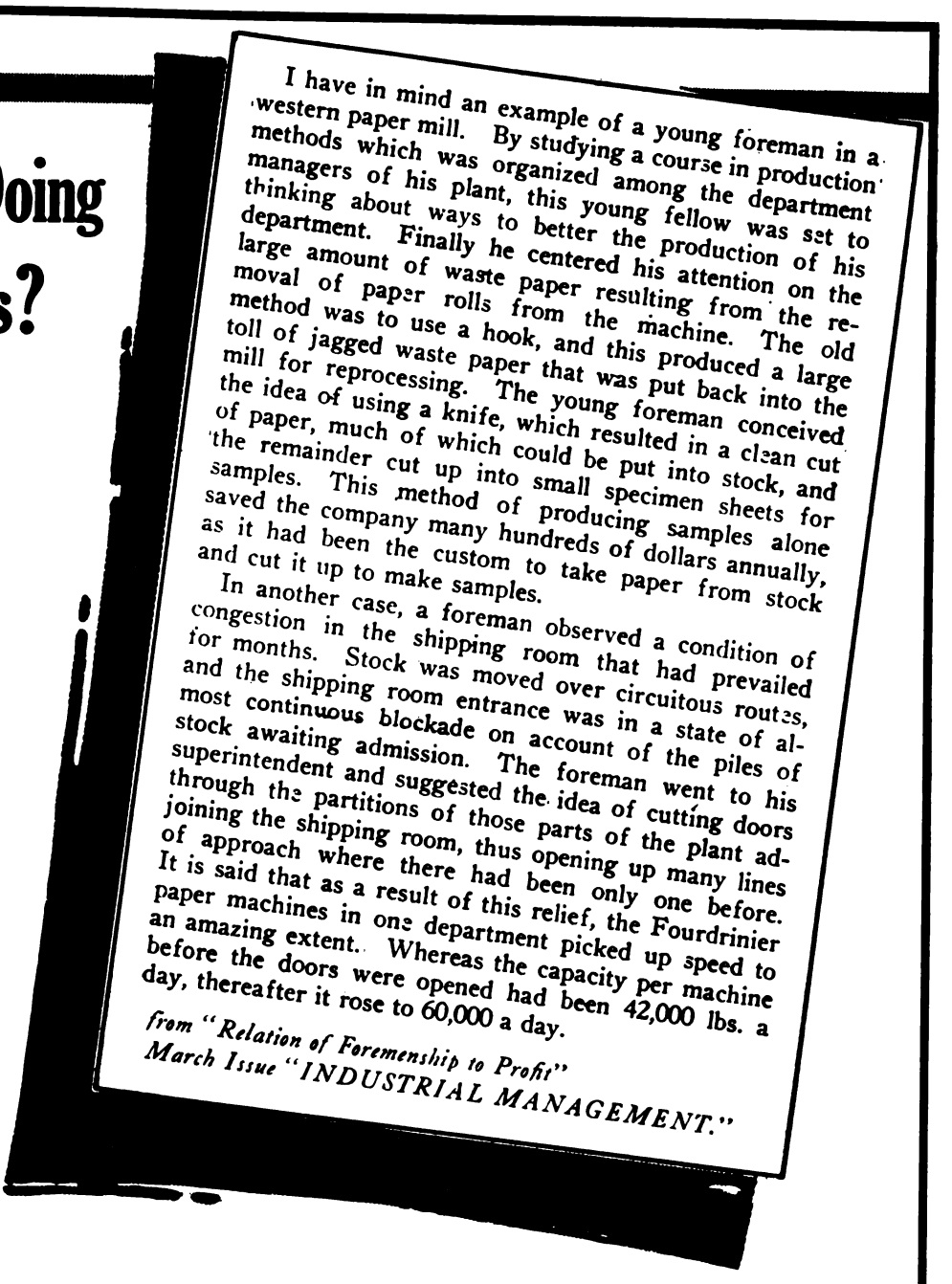
Both improvements were perfectly clear and simple; yet the wasteful methods might have gone on for years. Only when the foremen came in contact with ideas above the ordinary routine were their eyes opened to these chances for cutting costs and eliminating hidden wastes.

In every plant—in your own plant today—there are similar possibilities for improvement in processes and the elimination of waste. The top management, no matter how efficient, cannot be everywhere and see everything.

The foreman, on the other hand, is the man on the job. He is the key-man of the plant. He is in close contact with materials, machinery, and men.

He can cut your costs if he has the necessary training to think and make practical suggestions.

That the foreman is willing to co-operate, if shown the way, is evident by the results obtained from the Business Training Corporation Plan of Foremen Training introduced in over 500 plants.



I have in mind an example of a young foreman in a western paper mill. By studying a course in production methods which was organized among the department managers of his plant, this young fellow was set to thinking about ways to better the production of his department. Finally he centered his attention on the large amount of waste paper resulting from the removal of paper rolls from the machine. The old method was to use a hook, and this produced a large toll of jagged waste paper that was put back into the mill for reprocessing. The young foreman conceived the idea of using a knife, which resulted in a clean cut of paper, much of which could be put into stock, and the remainder cut up into small specimen sheets for samples. This method of producing samples alone saved the company many hundreds of dollars annually, as it had been the custom to take paper from stock and cut it up to make samples.

In another case, a foreman observed a condition of congestion in the shipping room that had prevailed for months. Stock was moved over circuitous routes, and the shipping room entrance was in a state of almost continuous blockade on account of the piles of stock awaiting admission. The foreman went to his superintendent and suggested the idea of cutting doors through the partitions of those parts of the plant adjoining the shipping room, thus opening up many lines of approach where there had been only one before. It is said that as a result of this relief, the Fourdrinier paper machines in one department picked up speed to an amazing extent. Whereas the capacity per machine before the doors were opened had been 42,000 lbs. a day, thereafter it rose to 60,000 a day.

from "Relation of Foremenship to Profit"
March Issue "INDUSTRIAL MANAGEMENT."

Thirty thousand foremen have been developed through this plan. They have gained a greater spirit of team work and a new insight into the real nature of their job.

Our new booklet "Straight Ahead for Better Foremanship" cites the experience of many well known concerns that have benefited by this plan. It may help in solving your problems of better production and lower operating costs.

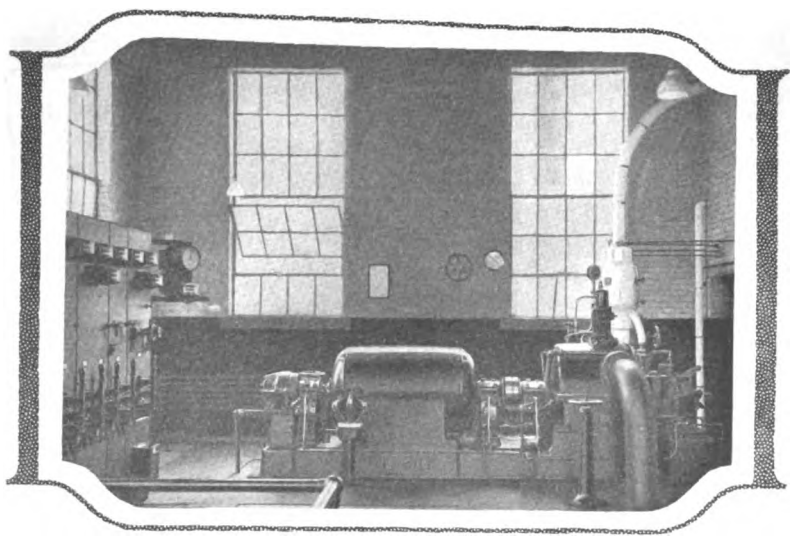
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Business Training Corporation

"Greater Team Work Through Group Training."

185 Madison Avenue *New York City*

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Power *at* Lower Cost

If your industrial concern requires steam for heating, cooking drying, or any other purpose do not neglect the opportunity to produce power as a by-product. The fuel cost for such power is less than one quarter that of the largest and most efficient condensing unit that could be built.

In some concerns the power requirements are so large that such a power unit of a size which will furnish only the required steam for heating could not develop enough power. In this case a Terry bleeder condensing unit such as is shown above would solve the problem.

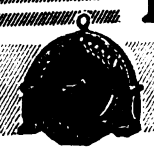
This unit is in effect a combination of a condensing and non-condensing turbine so arranged that part or all the steam from the non-condensing end of the turbine may be used for heating and any surplus pass on through the condensing end developing power.

Therefore by the use of such a unit you will be able to produce cheap by-product power and at the same time be assured of sufficient capacity to meet your power requirements.

Write for full particulars, stating if possible your average steam requirements (pounds per hour), your heating pressure, and power desired.

T-767

THE TERRY TURBINE



Offices in Principal Cities in U.S.A. also in Important Industrial Foreign Countries

The Terry Steam Turbine Co.
Terry Sq. Hartford, Conn. U.S.A.

(*Continued from Page 36*)

its inventor it was small and fragile and extremely erratic in its operation and it was impossible to make two tubes with identical electric properties and therefore interchangeable.

Shortly after deForest patented his device the telephone engineers became interested in it as a means of amplifying or relaying telephone messages on long distance circuits somewhat after the fashion described above. Before the tube could be applied in practical telephony its action had to be stabilized and all of its freaks and little idiosyncracies of character worked out. It also had to be perfected to the extent that thousands of tubes with identical properties could be made instead of each being a law unto itself. Moreover, the tube had to be made larger and so designed as to handle very considerable amounts of electrical power. But this is not the place to describe the numerous investigations, delving into such abstruse subjects as the kinetic theory of gases and electron physics, the results of which when pieced together proved to hold the solution of vacuum tube design. Indeed a very interesting article might be written on the single subject of exhausting the air from these tubes. Stable operation necessitates that the space within the bulb be as free from gases of all sorts as man's ingenuity can make it. This is difficult to accomplish even in the laboratory when one is working with a single experimental tube, and it assumes surprising proportions when it becomes a question of manufacturing thousands upon thousands of the highest quality of tubes cheaply. Various radio engineers have also from time to time made important contributions to the subject of tube design and the knowledge of its properties.

It is the duty of the telephone engineers to study every means of speech transference. Among these the radio telephone has assumed an important rank within the past ten years. They have therefore devoted much of their time to the development of the devices of wireless telephony. Among these are vacuum tubes to handle very much larger amounts of electric power than is required of the tubes used in wire telephony.

A few figures will illustrate how great this development has been. In 1915 the Bell System established the historic record of transmitting speech by radio a distance of 5,000 miles from Washington D. C. to Honolulu. To do this they use a battery of 200 tubes, each tube being about 20 times as powerful as the standard telephone amplifier tube. At the present time these engineers are making water-cooled tubes so powerful that four tubes could replace the battery of 200 used in 1915. Each tube is capable, therefore, of handling about 2000 times as much power as the standard telephone repeater; putting it in terms of power, each tube is capable of handling ten to fifteen kilowatts.

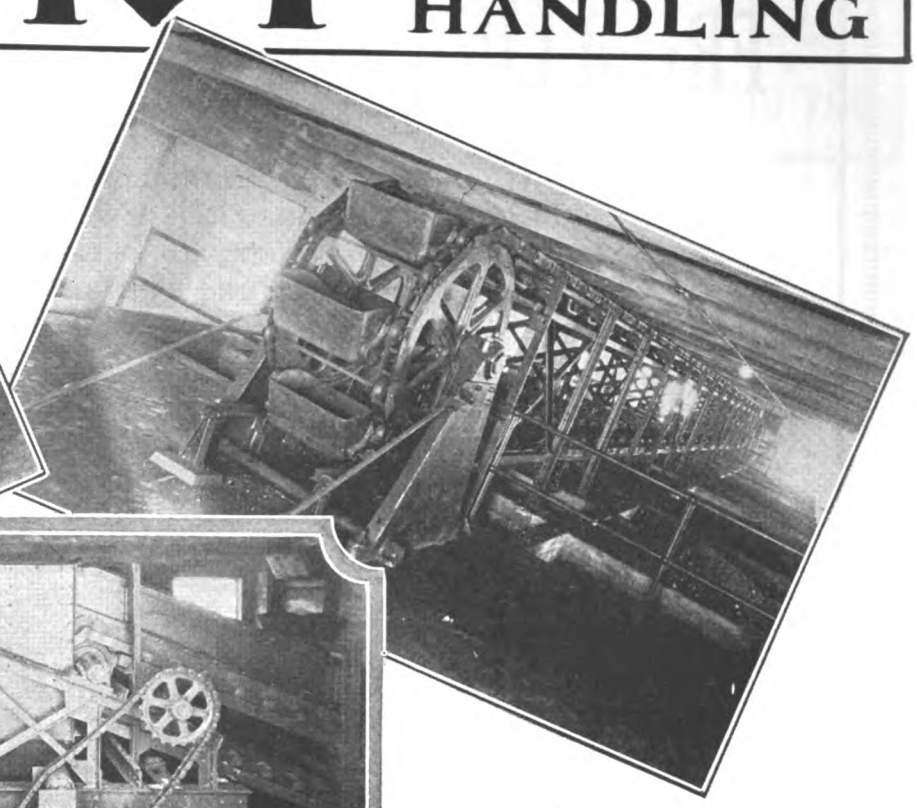
Today there is a vacuum tube for well-nigh every purpose. On one hand we find the little tube about the size of a peanut whose filament can be heated by a single dry battery and which is very much coveted by the radio amateur. On the other hand is the big water-cooled tube designed for long distance radio telephony and telegraphy. Between these two extremes are to be found any number of different designs for scientific laboratories, for telephone repeaters and for a wide variety of miscellaneous purposes. These tubes are used for amplifying electric currents; for generating high frequency oscillations which in turn are used to produce the electric waves used in radio transmission; they may be used to receive or detect these same electric waves, and they may be used to modulate the high frequency oscillations with speech, this being an essential operation in the radio telephone.

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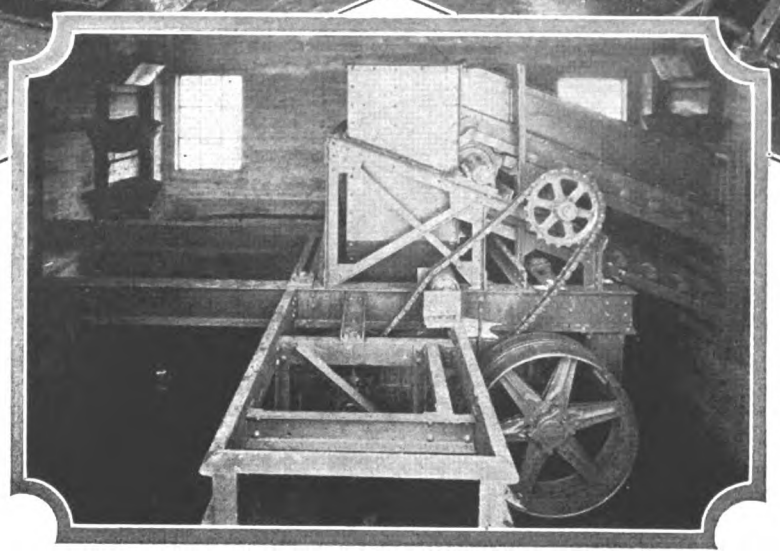
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Control Panel and Hoisting Machinery for Skip Hoist



Double Run of Conveyor over Coal Bunker



Apron Conveyor Feeding Coal into Coal Cracker

Cutting Down Power Costs

EVERY item of labor involved in getting coal from the cars to your grates, and in removing the ashes after combustion, is just that much added to your power costs.

The photographs grouped on this page show a complete coal and ash handling equipment which we recently installed at the Utica State Hospital.

The installation shown effects a great saving in the handling of coal and ashes.

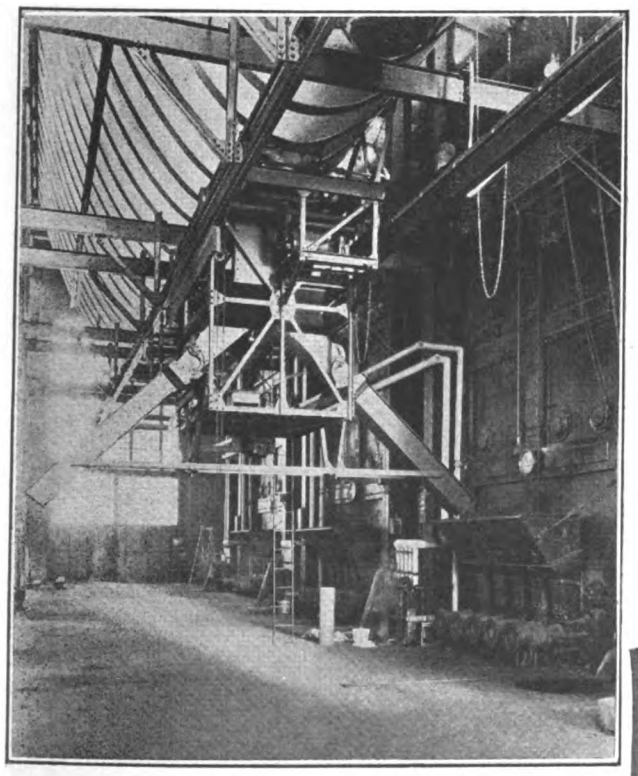
Our engineers are prepared to submit interesting figures on economies that can be effected in *your* power plant.

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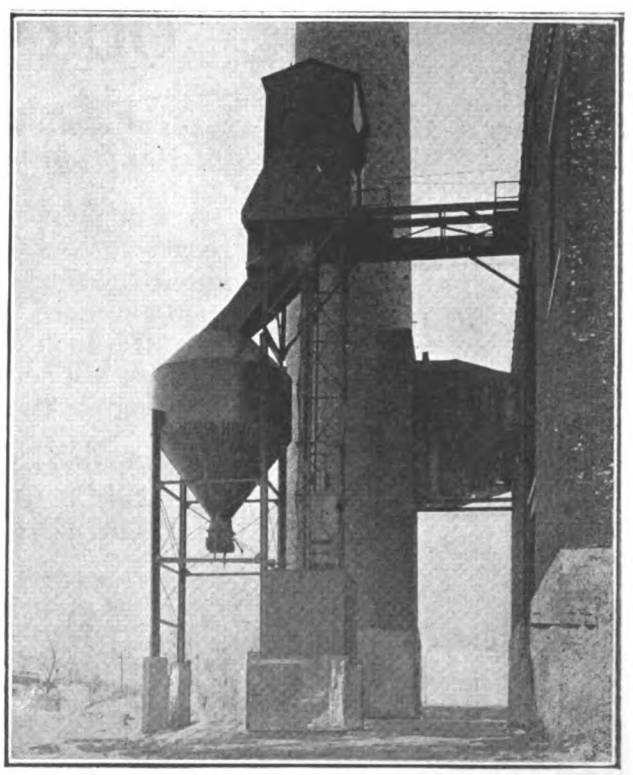
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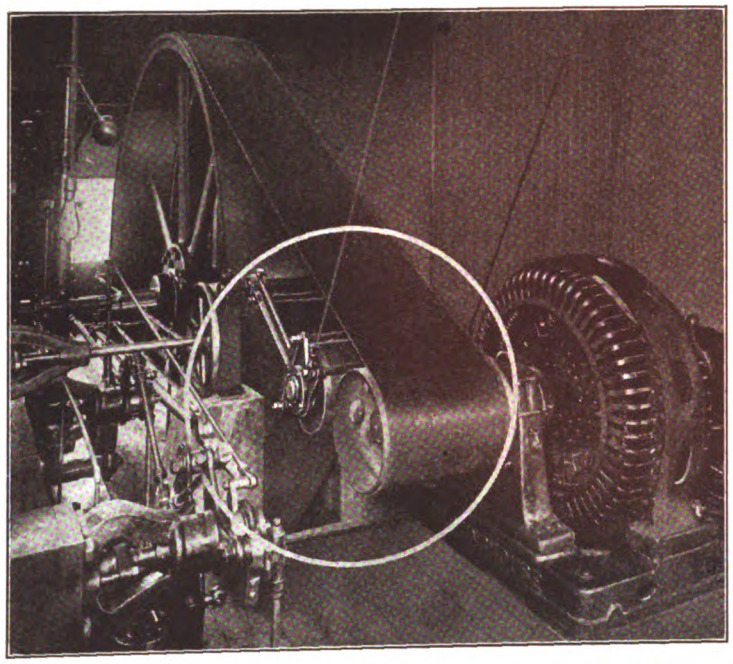


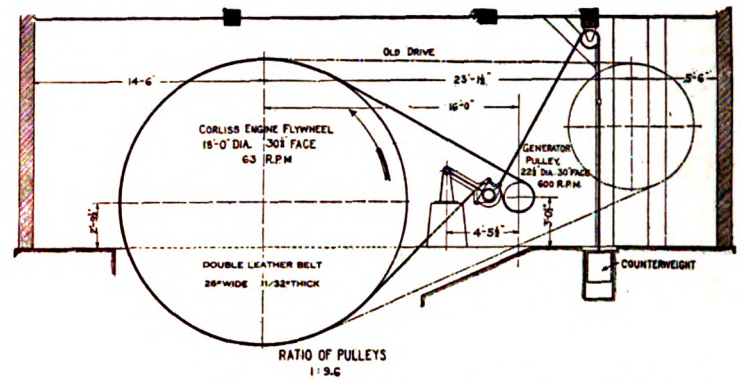
General View of Utica State Hospital Power Plant

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FROM LINESHAFT TO GENERATOR OVER NIGHT

At the plant of a prominent Surgical Specialties Company, the original system of power transmission was a steam engine driven lineshaft. They decided to install a generator and change to individual motor drives. To make the change with the least loss of time was the problem.





Corliss Engine-Flywheel 18′0″ dia., 30½″ Face 61 R.P.M.
200 K.W. Generator Pulley 22½″ dia., 30″ Face 600 R.P.M.
Pulley Centers 16′0″
Pulley Ratio-about 1:10
Medium thick, double leather belt 28″ wide.

OUR SHORT CENTER DRIVE

made it possible for them to change from lineshaft to generator without interfering with the operation of the plant.

The Generator and our KORAP*LENIX Drive were installed between the steam engine and the lineshaft pulley. When everything about the plant was ready, the original main drive belt was cut, shortened and used on the new installation, the work being done on a Saturday afternoon and Sunday. The steam engine remained in its original position. The new installation was ready for operation Monday morning.

Wherever belts are used for the transmission of power, whether the tight side is on top (as in this case) or bottom, or quarter-turn, the KORAP-LENIX will improve your drive.

Our booklet "Saving Slippage and Space" tells how

Ask us for it.

F. L. Smidth & Co.

ENGINEERS

50 Church Street **New York, N. Y.**

*Improved LENIX Drive

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Complete Assembled Product of Any Nature of a Medium Light Grade Interchangeable Type.

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Please refer to box 100, c/o Industry Illustrated, 120 W. 32nd St., New York, N. Y.

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Industrial Management's Cost Control Committee Plan Bulletin

Containing practical suggestions for business economy—showing how to get the spirit of economy and waste elimination to pervade the ranks—detailing all the mechanics of the Cost Control Committee Plan—suggesting makeups of the various Committees—giving concrete examples of Cost Control work—outlining suggested activities for various sub-committees.

The many who have read the booklet and acted upon its practical, common sense suggestions, pronounce it the most effective and logical method of creating a real economy morale in any organization ever proposed.

Every executive, whether he adopts the plan as a whole or not, will find in this booklet a worth of stimulus and food for constructive thinking along new lines.

Where shall we send your copy?

Industrial Management
120 West 32nd Street
New York, N. Y.

Huge Iron Ball Used To Pound Building to Pieces

BY R. H. MOULTON

Probably getting his idea from the ease with which huge shells demolished buildings during the war, a Chicago contractor recently conceived the plan of using an iron ball weighing over half a ton to raze an eight-story, reinforced concrete building of modern construction.

In order to facilitate the work, as well as to economize in the amount of manual labor required to demolish the building, the contractor built a wrecking outfit that would operate between the columns of the building. It consisted of a stiff-leg derrick and a forty foot boom, mounted on a 16 by 24 foot platform with rollers, the iron ball, or "skull crusher," being carried on a single



fall line. A twenty-five horsepower direct current electric hoist furnished the power for hoisting and swinging. To get this outfit to the roof of the building, where, of course, the work of wrecking had to begin, was something of a job in itself and required several days.

The method employed in using the ball was to drop it through a distance of forty feet upon the central parts of the floor panels. Some idea of the force of the ball when dropped from this height may be gained from the fact that it crushed through eight-inch reinforced concrete floors with all the ease of a six-inch shell fired from a howitzer. Only a few blows were necessary to break up a panel, after which the wrecking outfit was removed to another one. When all but one panel had been demolished, the outfit was lowered to another floor under its own power. By this means the building was razed in half the time that would have been required by ordinary methods.

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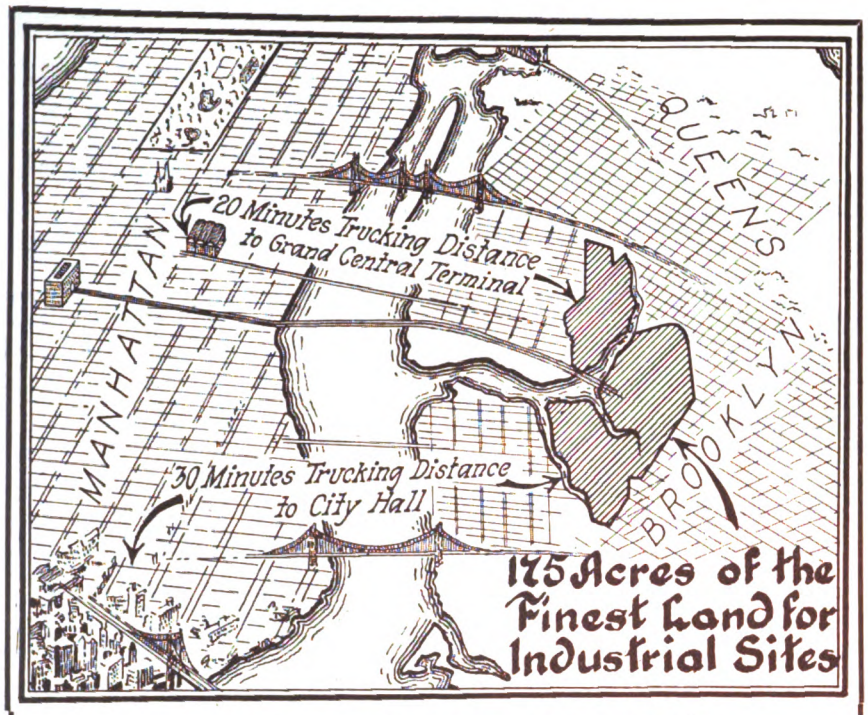
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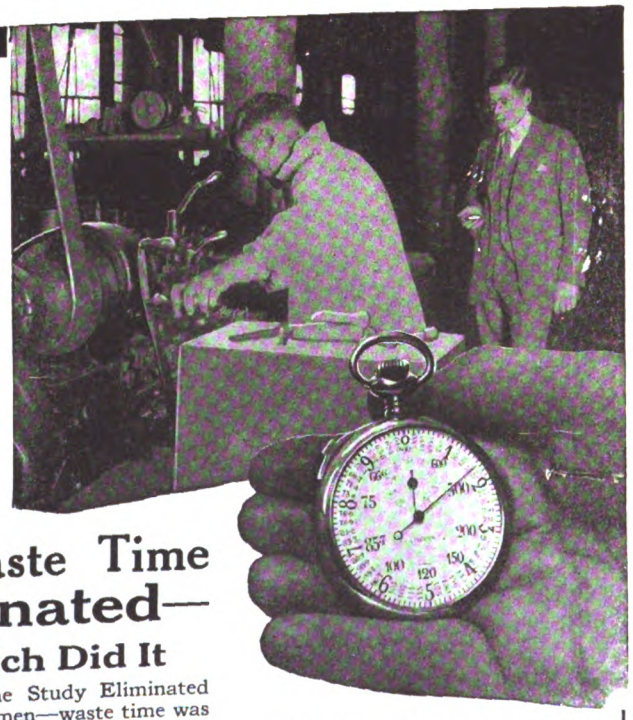
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The Watch Did It

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"Making Time Studies Pay" by B. M. Maynard, and read how 5 men and 38 per cent wasted time were eliminated. We will gladly send a copy on receipt of your request together with a brief story of how the Time Study Watch saves and excells. It entails no obligation.

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It is not necessary to wait a week for comparative figures—you can check it up immediately with the

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In thirty seconds you can check the comparative motions on any operation. No waiting — no exhausting tabulations— no counting. The S. & E. Watch does it automatically, simultaneously with the operation. Our line comprises a watch fitted to your need no matter what it may be. Write today for folders.

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35 NORTH STATE STREET, CHICAGO

Time Study Watches Precision Instruments Stop Watches

The Future of the Radio Telephone

(Continued from Page 11)

"As the wireless developments at that time were being conducted very secretively I was careful not to create any suspicion in asking questions, but I soon learned that this enterprising fellow was selling my music which I transmitted every evening from my experimental station. He merely put up a receiving set, tuned to my transmitting station and allowed visitors to listen to the receivers for a few moments at 10¢ a throw.

"About the same time I received a letter from Mr. J. H. MacDonald dated July 20, 1911, who was the wireless telegraph operator in the employ of the Canadian government at Point Gray, about 200 miles from Seattle, stating that it was very wonderful of me to break up his monotonous moments by giving him musical selections and entertainments.

"Thus was born in me the germ of broadcasting wireless music and entertainments to the public. I did not realize the possibilities—in fact no one with the broadest imagination could see then that the world would be revolutionized over night by this new wonderful system of transmitting intelligence without wires.

"Six months ago probably 100,000 receiving sets were in use. Today it is conservatively estimated that over a million homes are entertained and educated by means of the radio telephone. I know of no science which has advanced civilization in such a short period to an extent equal to the promising outlook of the radio telphone. It will annihilate distance entirely, so that the Japanese, Eskimos, South Americans, Icelanders and the Siberians will become neighbors and will soon adopt a common language, thus eliminating national hatred and distrust and possibly future wars. In the very near future one will be able to talk from his office or home, 'phone to his friend on a steamer in the middle of the Pacific or the Atlantic.

"The farmer will become city-fied, and the cartoons showing the country hotel with a stove in the centre of the lobby, around which the local topics are discussed, will soon be replaced by a radio receiver and the deadening monotony will disappear. They may be listening to an opera or to a candidate for President, electioneering from his home, or to the news which formerly took a week to reach them.

"No woodsman or camper will be isolated, for pocket receiving sets will be developed, so that some day we will see the traveller throw a wire over a tree and listen to the news or be amused by a Broadway musical show. Every pullman train will have its radio telephone and the stock news tickers are already being replaced by radio receivers. Everything of interest will be broadcasted and every modern up-to-date apartment house will include in its service radio entertainment and news, the same as hot water and steam heat now supplied. Radio universities will be created and regular lectures and courses given.

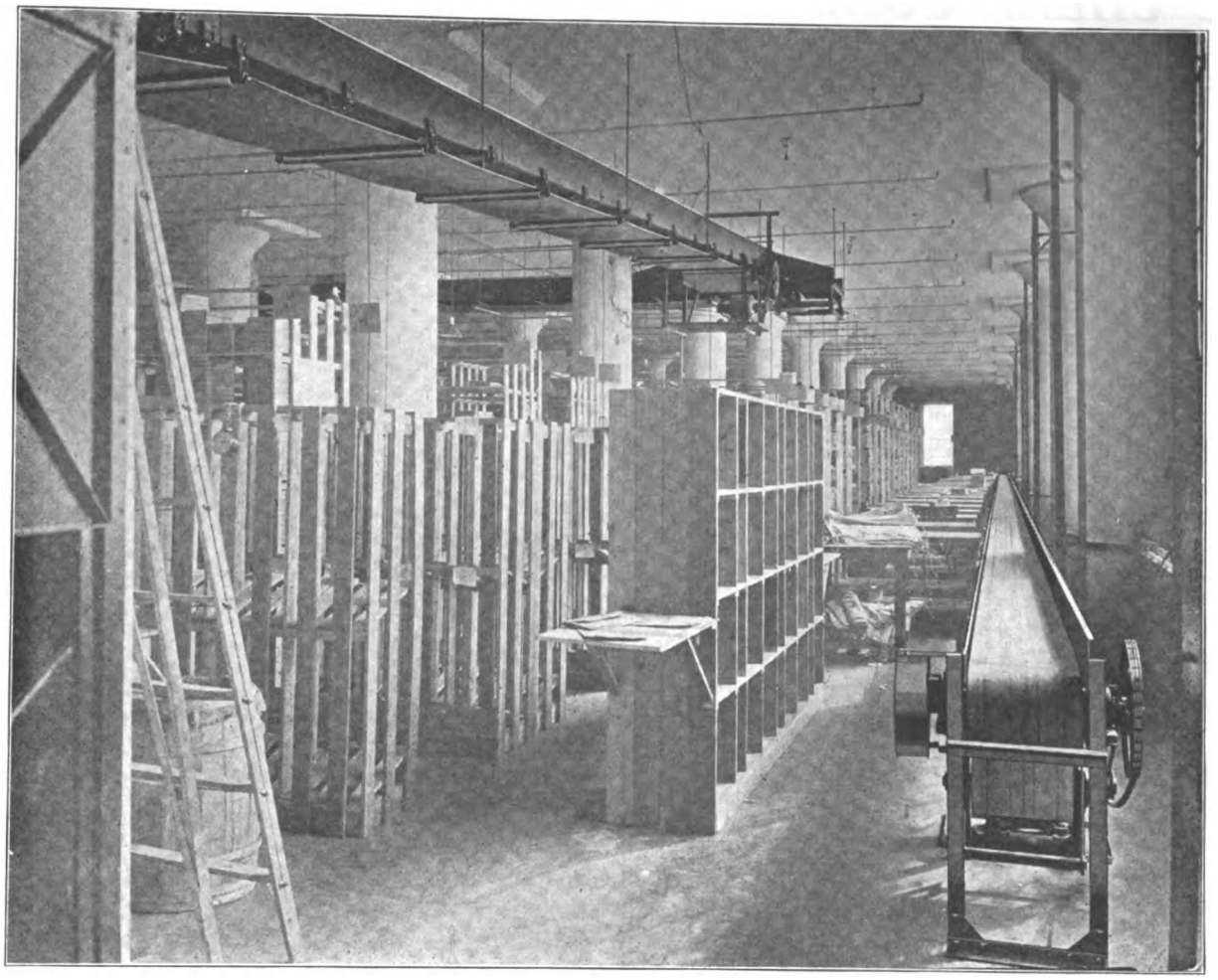
"The advertising value of broadcasting is enormous and the public will benefit, for no longer will they be able to force you to look thru the newspapers and publications between the advertisements for the news, but the stores and the political candidates will hire the finest talent to amuse you, as an inducement to listen to their personal stories.

At last the public has found a means whereby it will be difficult to force propoganda down one's throat and the keen competition that broadcasting will soon give the newspapers will compel them to give the public unbiased news. The big vaudeville circuits have already issued orders preventing their artists from singing for broadcasting stations—amongst them is Keith's. The result of this will be that favored and inefficient artists will no longer be tolerated.

"And so we can go thru almost every important phase of life which will be affected in some way by broadcasting, which is establishing itself as a keen competitor to practically every public educational or amusement service: such as the newspapers, theatres, telephones and telegraph companies, mediums for political

(Continued on Page 44)

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Showing the manner in which belt conveyors can be installed. Note the conveyors hung from ceiling as well as conveyor to the right placed on floor.

Why Did The Diamond Match Company Equip Their Plants with Conveying Systems?

Because they realized that efficient handling of the raw materials entering into their finished product through the various operation stages meant increased production.

Production of a product has its inception the moment raw materials are received and is not completed until the finished product is in shipping room.

Raw materials, products in various stages of completion and the finished product should be handled mechanically in order that production be increased.

A conveying system to be efficient must be designed to conform with individual requirements. Your method of manufacture must be studied carefully in order that the proper system can be developed.

We will gladly have one of our conveyor engineers call and make a survey of your handling problems. Write us at once. This service does not obligate you in any manner.

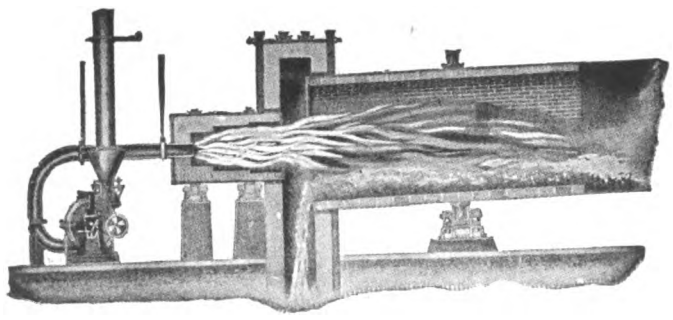
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There are now many successful Aero Pulverizer installations to which we will be glad to refer you. The Aero Pulverizer burns coal as pulverized. There is no storage of powdered coal with its attendant hazard.

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Wouldn't you give it a hearty welcome?

Wouldn't it put a dash and a sparkle into the daily grind you have always wanted—but which you have found hard to get?

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(AD-MAY)

(*Continued from Page 42*)

propaganda, religious institutions, etc. Our future preacher will have to be versed in every religion, for the Catholic, Protestant, Jew, Hindu and even the Athiest will be his audience. In short, the big thing about Radio is that it will make more real and apparent the universal brotherhood of man."

The Engineer in Relation to Manufacturers' Dividends

(*Continued from Page 14*)

is responsible for the company's reputation with its customers. Upon what he does today, depend tomorrow's dividends. The most perfect organization, the most up-to-date factory, the most modern selling organization will avail nothing if the product is allowed to get out of date.

We all know concerns in which this has happened, the country is strewn with their wrecks. Granted this conception of the engineer's position, his various detailed functions assume a definiteness of purpose that is bound to react favorably upon their efficient performance. Nothing contributes more to the efficiency of one's work than a clear conception of its fundamental purpose.

The various functions of the engineer are field research, laboratory research, design, establishment and maintenance of quality in manufacture, service to customers, preparation of sales arguments and advertising material. All of these functions are for the one purpose of establishing and maintaining profitable connection with the customer, except where research work is undertaken in the interest of manufacturing efficiency.

Let us consider these various functions in somewhat greater detail:

I mentioned field research first, because it is the means whereby the consumer's needs are ascertained. The consumer's needs are not necessarily the same as his wants. If contact with the consumer is left to the salesmen, the wants and not the needs, will be learned. The consumer, speaking generally, purchases many kinds of things and is therefore not such an expert as the producer's engineer, whose interests are confined to one class of things. In other words, the producer must educate the consumer to purchase intelligently and this cannot be done unless the producer knows the consumer's needs.

Research work in industrial laboratories is accelerated experience. We use science in our industries because it enables us to acquire experience more readily. If science and research are regarded in this light, they are indispensable adjuncts to our industrial system—if regarded as substitutes for experience, they will lead to industrial disaster, just as the social theorists of Russia have led their country into disaster by imposing upon it a theoretical and untried social system.

When a new industry is to be started the principal experience upon which to base its processes had best be acquired in the research laboratory, but when a research laboratory is established in an old industry, its first function should be to find the reasons for the processes then in use and it should be very wary about suggesting changes until theory and careful experiment agree in support of the suggestions. A research engineer, who establishes a reputation for absolute reliability in his statements becomes invaluable. One who puts bad science against good experience only courts disaster.

How is the "accelerated experience" of the research laboratory to be made of benefit to the manufacturing department? There are two problems here, a human one and a technological one.

The human problem is to get the practical man to absorb the accelerated experience of the research laboratory. The technological problem is to translate the research data into manufacturing instructions.

Practical men, that is men who use only slowly acquired

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experience, often have a curious conception about men of scientific training. They think that the latter are much influenced by theory, which they conceive as a kind of rarefied reasoning which floats above the realm of facts, lightly touching earth at a few widely separated points. The contrary is the fact, the scientific man being particularly interested in ascertaining facts, whereas theories, to him, are like garments to be tried and cast away when worn out.

Rule-o'thumb procedures often give good commercial results as far as they go, but eventually the progress of related industries will demand that scientific methods replace them.

When this stage is reached the industry is confronted with the serious problem of introducing the new methods without losing the valuable accumulated experience which has formed the basis of its past progress.

Two procedures are available. One would be to have the research department study every phase of manufacture and present complete recommendations for all changes in equipment, method and personnel without any co-operation from the existing organization. The other way would be to have the research department study all process in collaboration with the existing manufacturing organization, and to make the necessary changes slowly.

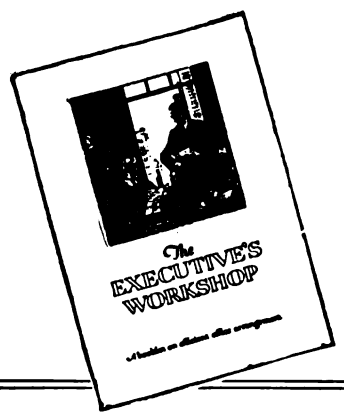
In choosing between these methods, the availability of capital, the condition of the plant, and the personal characteristics of the individuals concerned are important considerations.

The establishment of a working connection between the research department and the manufacturing department is often a difficult matter due to the possible temperamental difference and difference of interests between the men in the two departments. The one group idealizes thought, is interested in precision, the other idealizes action and is interested in production, and there is a wide gap between the two ideals. A thorough realization of his own limitations by both the scientist and the practical man and a wholesome respect for the other's attainments will help, more than anything else, to establish co-operative relations between them.

But little need be said about design because that was the first recognized function of the engineer, but many manufacturing concerns do not realize that their products are suceptible of design, i. e. they do not design them to fit the consumer's needs, but take the path of most resistance by trying to force their products upon an unwilling market.

Maintenance of quality is essential to the manufacturers' future success. If responsibility for quality is given to a department independent of both production and sales, quality will suffer because the control will be unpractical and will therefore not be respected. If left entirely to the production department, quality will likewise suffer because the consumer's point of view will be neglected. The only logical man to bear the responsibility

Are You "Tied Down to a Desk"?



Your copy will be sent on request without cost or obligation.

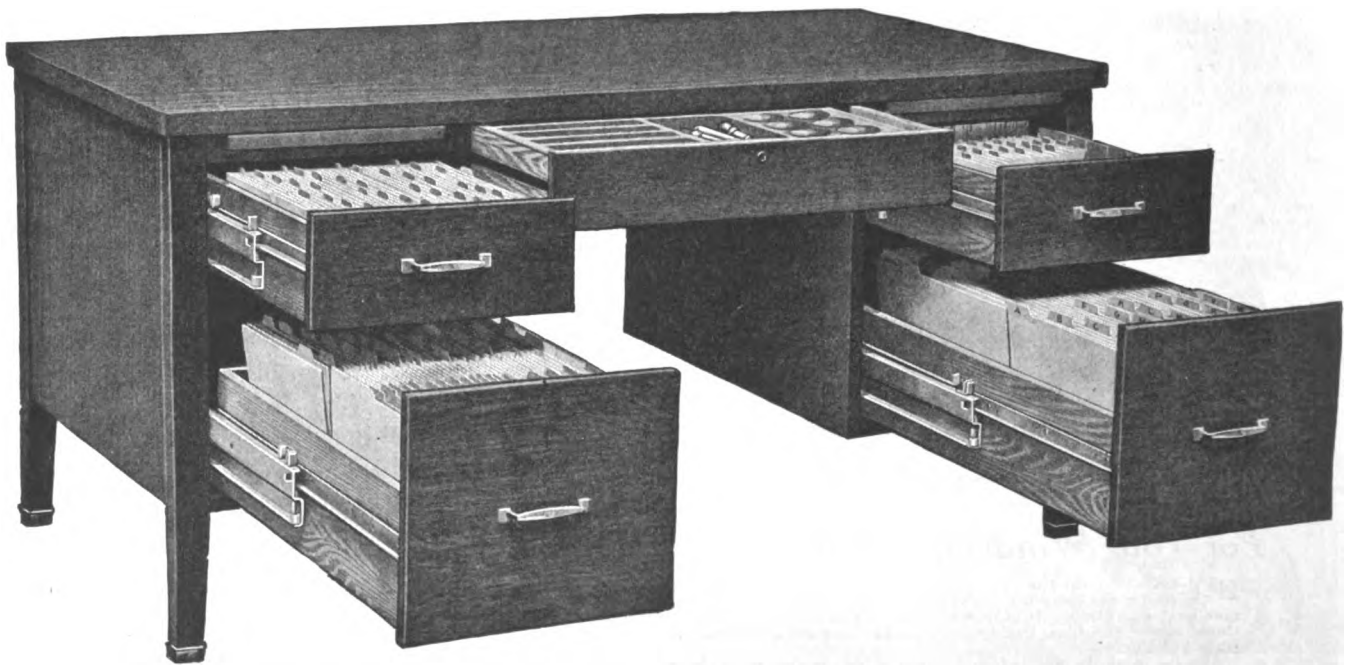
IT is really only a matter of choice, whether you are to be a slave to your desk, or whether the desk is to be what it was meant to be——an efficient tool to help you accomplish your work.

The average office desk involves too much waste space, too much waste effort in finding necessary things, too much distraction from the really important thing of ***getting the work done.***

One of the scores of big business men who have adapted the "Y & E" Efficiency Desk recently summed up his experience thus:

"My Y & E Efficiency Desk gives me a breathing spell——an opportunity to hurry through a mass of irksome routine and get down to the bigger things of the day's work. It has enabled me to accomplish much more in a given time, and with better concentration."

Irrespective of whether you need a desk or not, you will find the booklet "The Executive's Workshop" a valuable aid in planning the day's work.



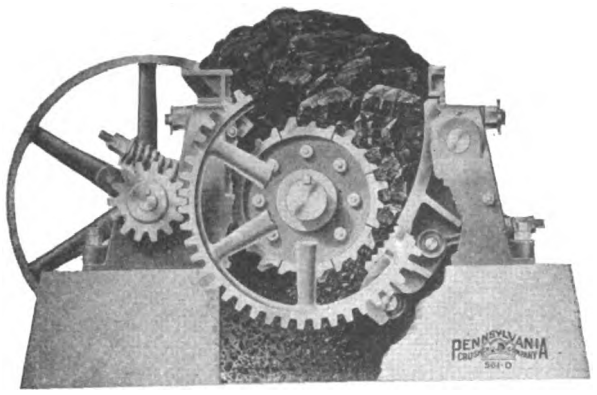
YAWMAN AND ERBE MFG. CO.

543 St. Paul Street, ROCHESTER, N. Y.

Branches and Agents in all principal cities

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"PENNSYLVANIA"
COAL PREPARATION
MACHINERY



THE return of competitive markets,—buyers' greater knowledge of coal values, and the general use of automatic stokers, are all factors which point to the imperative need for accurate, efficient coal preparation, by both producers and users.

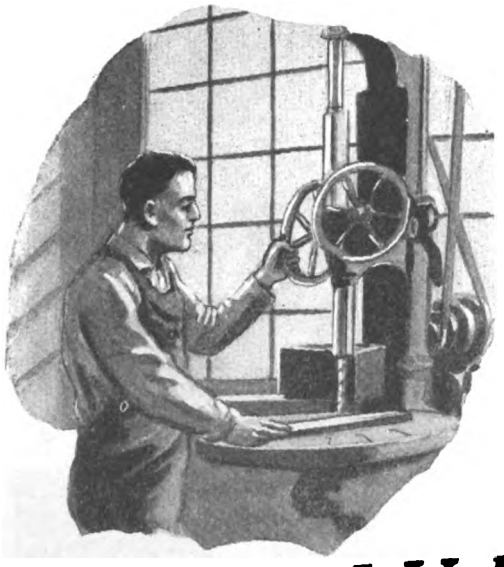
The "Pennsylvania" Line includes three distinct types of coal crushing and cleaning machinery, specialized for preparing all kinds of bituminous coal at Mines, Washeries, Central Stations, Coke Works, Coke Plants, Gas Works, and Industrial Plants generally.

Two of these types automatically eliminate Tramp Iron, and the third is thoroughly protected against damage from it.

Experience with varied coal preparation problems has fitted our engineers to give you practical co-operation.

PENNSYLVANIA CRUSHER COMPANY

1320-1325 Stephen Girard Bldg. Philadelphia, Pa.



Let in the Light Without the Glare

"GLARING light" heads the list of "Wasted Money Practices," compiled by the Wisconsin Industrial Commission.

Flood your workrooms with soft, efficient light, yet keep out all the glare by coating windows with

BLU-EE
TRADE MARK

For Your Windows—Means Better Work

BLU-EE keeps out the rays below the line in the spectrum-rays that give heat and glare. It only allows those above the blue line to penetrate unhindered.

Blu-ee is easily applied—simply dissolve in hot water, allow to cool, and apply with a paint brush. One coat lasts for months.

It gives a clear white light—saves the eyes and gives employees a chance to do their best.

Try Blu-ee at our risk. Fill out coupon and mail at once.

PARK CHEMICAL COMPANY
3822 Edwards Road Cincinnati, Ohio

Try It Out—We Run the Risk

PLEASE send me 2 packages of Blu-EE, sufficient to cover 2000 square feet of glass. It is understood that I am to use one of the packages as directed and will remit $5.00 for both if I am satisfied with Blu-EE, and if not entirely satisfied may return the other within sixty days and you will cancel this order.

Firm Name..... Position.....

Your Name..... Address.....

for quality is one in touch with both consumer and producer, namely the engineer.

Service to customers determines the placing of many orders and is a purely engineering function. The only *service* that a salesman can render is to expedite deliveries and replacements. The purpose of the engineer's service is to secure economies for the consumer or improve his service, at a profit to the manufacturer. This is done by offering, with a product, convincing arguments of its superior economy or efficiency, and to do this requires that the consumer know that his particular service conditions have been carefully considered, by the manufacturer, in making the recommendations.

The preparation of sales arguments for the use of salesmen is often left to chance, but it is an engineering function because sales arguments, to be effective, must show how some peculiarity of the product makes it suitable to meet some peculiar need of the customer. Without this, selling reduces to price cutting, entertainment, reciprocity, agreements, or politics.

If selling without sales arguments is a difficult and unsavory art, what shall we say of advertisements made by professional copy-writers who know neither the product nor the market. A glance through the pages of any trade journal will reveal the fact that few manufacturers have any idea of advertising beyond the conspicuous placing of their name. There is seldom co-ordination between advertising and the other sales efforts. There is seldom anything in the advertisements to show that the manufacturer has made any progress during a generation, and there is almost never anything interesting to read in the copy. The reason is that the copy is so often prepared by men in contact neither with the product nor the conditions of its use. The matter for advertisements should be furnished by men in contact with both, namely, the engineer.

There are other fields for the manufacturer's engineer and it it time for more manufacturers to realize that their engineering departments are or should be made to **assume** a definite function such as I have endeavored to outline to you, where their relation to dividend making stands out in its true light.

The Psychological Aspect of Piece Work

(Continued from Page 13)

The result is that he is contented and feels like a man who, knowing his duty, sees that it is performed, and effected without being driven.

Some classes of work are more monotonous than others. Take, for instance, automatic machines—I mention this class especially as it was the subject of an article by an industrial investigator, in regard to finding methods for making this class of work less monotonous. This work is not deadening when the workman is on piece-work. He has his machines to keep running—interest; his day's work to get out—interest; watching the machines for his own benefit—interest; pride in his work, in order to avoid scrapped work—interest. The incentive aroused by working for himself—(he *is* when working on piece-work)—also gives interest. If his machines are running smoothly he can converse with his mate as they pass—avoidance of the prisoner feeling—which stimulates manhood, self-respect and contentment.

On drill-press work, a job also classed as monotonous and dulling, there is interest if the operators are accomplishing something. Dump a few boxes of work before them and let them work into them, stopping at the end of the day with no idea of what they have done—and indifferent—and they are dull and fagged. If on piece work, they will have accomplished something to think about that is to their direct interest. Compare their position with that of the day worker who has nothing but the clock to interest him. His

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Uncommon Sense Applied To Advertising



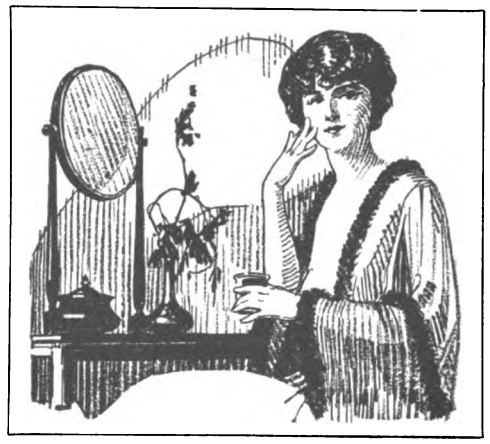
General Manager. Of all the jobs you ever wished on me that one of settling our advertising question is the worst.

President. Why, what's hard about that? I thought you intended to look up three or four advertising concerns, decide which one was best and leave the rest to them.

G. M. That was my intention, but after talking with a few of them I'll be darned if I can see how any of 'em can help us.

Pres. Well, why can't they? I thought these "advertising sharks" knew how to advertise anything!

G. M. So did I, but I'm not so sure of it now. Let me ask you something; would you hire a man to sell our machines because he'd been a "whirlwind" at selling "Darn-em-never" Hosiery or "Lasting Beauty" Face Cream or "Can't-Scratch" Garters?



Pres. Of course not — but what's that got to do with it?

G. M. Let me tell you about the advertising man who just left and then you'll see quickly enough. Oh, the boy sure could talk! He must have taken lessons of Bill Bryan, Bob LaFollette, Burke Cochran and all of the "silver tongued orators" we've had in the last twenty years. He almost made me believe that we would sell our machines to every "flapper" from here to Seattle if we could only let their man who put across "Knobby Klothes for Klassy Kids" write our advertising.

I asked him what "Get-a-shape" Corsets and "Silky Sheen" Petticoats had to do with a machinery advertising proposition; thought that might floor him, but it didn't. He was right back with something like this: "The underlying fundamental principles, the psychology of all advertising is the same whether you are advertising baby food or bridges."

Then he followed that up with a hifalutin dissertation on mental complexes and reactions, national consciousness and a lot of other highbrow talk that I can't remember. What I don't get though is how this "mental complex" and "national consciousness" stuff is going to sell one of our machines to a hard headed plant manager.

Wait a second there's the 'phone ---

"All right, send him in, I'll see him" ---



It's another of those advertising men, a fellow named Tyson; just stay and listen in and you'll learn for yourself what I'm up against.

How are you Mr. Tyson; this is Mr. Smithson, our President. Just sit down the other side 'the desk and tell us what you can do for us.

Tyson. Don't know whether I can do anything for you. Tell me something about your business first; how many types and sizes of machines do you make; how do you sell them; who buys them; what are they used for; go ahead and tell me everything you can think of about them.

G. M. What in the name of all the Ex-Kings of Europe do you need all that information for? Another of you advertising experts who was in here this morning said "Advertising is Advertising" and Claimed that if you knew how to advertise *one thing* you know how to advertise *anything.*



Tyson. Yes, and Ellis Parker Butler said, "Pigs is Pigs" but he found out that there are guinea pigs, razor backs and plain hogs. If you have anything from toilet soap to trundle beds to advertise it's out of our line, but we do know how to advertise everything from tote boxes to turret lathes. If it's any kind of an industrial or technical proposition we know how to handle it.

G. M. That's a new one on me. How long have you been at it?

Tyson. No, it's not new. We've not only been in business ten years but the first client we got after starting in business is still with us.

G. M. I'm beginning to see a "ray of light." We will gladly tell you all about our product, our sales problems and our markets but, while Mr. Smithson's here and before I take you out into the plant, I'd like you to tell us something more of your story.

Tyson. Probably the best way to cover that would be for me to show you what we are doing for other clients whose products are related to but not competing with your own. Then I'll tell you how we went about our investigations to get information of their products and problems vital to successful advertising. I'll explain to you how all forms of advertising, magazine, direct-by-mail, circular and catalog are inseparably correlated, and how all must be interwoven into your sales plans to secure

* * *

We're sorry, but big as the publisher made this page he didn't make it quite big enough to finish our story. A little book, small enough to slip into your pocket but big enough to tell the whole story, is now being printed. If you've read this far you'll probably want to see a copy. We'll gladly send it—or a half dozen if you like—write, 'phone or wire. Doesn't make any difference whether you are thinking of advertising or not—ask for as many as you may wish.



RICKARD
& COMPANY, INC.
PRODUCTIVE PUBLICITY
25 SPRUCE STREET, NEW YORK CITY

PRODUCTIVE PUBLICITY

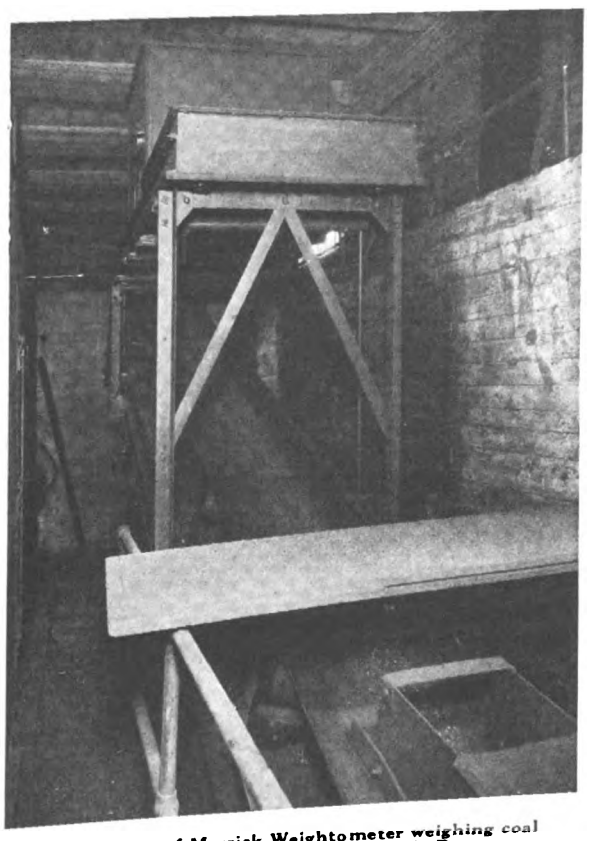
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WHY PAY FOR MORE THAN YOU RECEIVE?

Are you able to tell ***exactly*** how much you receive, or must you rely on B of L weights? Weigh your coal or other commodities as they are delivered at your plant over a

MERRICK CONVEYOR WEIGHTOMETER

Hundreds of concerns buy and sell their products using Weightometer Weights



THE MERRICK WEIGHTOMETER weighs and records the weight of any material while in transit over a belt, bucket or pan conveyor.

Check weight of raw material or finished product.

Installation of Merrick Weightometer weighing coal as received at a large U. S. Army Supply Base.

NO WEIGHMAN OR ATTENDANT REQUIRED
GUARANTEED AND PROVEN 99% ACCURATE



For Information Write

MERRICK SCALE MFG. CO.,
PASSAIC. N. J.
180 Autumn St.

(Continued from Page 46)

pay is earned when the whistle blows at the end of the day. He is not working for himself, he is just working for ten hours.

In the writer's experience, covering twenty years, it has been observed that in shops where there is a piece-work schedule the workers are happier, more progressive, less liable to change positions, and care very little about industrial problems as offered by various agitators.

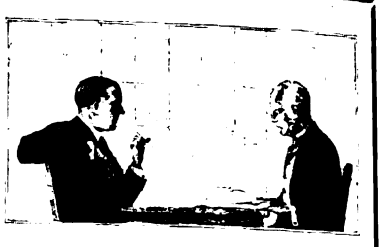
In a town of sixteen thousand people, there are several fair sized manufacturing establishments. Every trades union in the town is represented among them, some of which are hatters, stove-moulders, stove mounters, core makers, ladies' garment workers, machinists, etc. Practically all these shops are on a piece-work basis. The shops are fairly well organized, but open, and there has never, to my knowledge, been a strike in the town of these crafts.

Labor unions are opposed to piece-work. Labor organizations must thrive on discontent. They are opposed to piece-work for several reasons: foremost, they claim that it is an effort to drive production at the expense of the workers. Other reasons might be that where fair methods of piece-work are installed they cannot find a ready market for their wares, which is organization.

In my experience, it has been found very hard, if not impossible to "organize" many shops where fair piece-work methods are the scheme of production. It is, usually, very easy to organize the day workers, but the piece-workers, engrossed in other thoughts, remain indifferent to the argument of the agitator.

The day worker, is an apt subject for the preaching of discontent. He has nothing else on his mind all day but to think it over and nurse his long hours. It might be stated, here, that he *should* be interested in his work. The man should have been interested in picking up Barnum's brick and laying it down again —he was to be paid for doing it— but evidently he was not. If his life's work, however, consisted in just doing that

(Continued on Page 50)



"The PHOTOSTAT is Largely Responsible For That Increase in Sales."

"When we installed the PHOTOSTAT, I saw that it could be made of invaluable service to the sales department. At our last meeting all the salesmen said that the PHOTOSTAT copies of the engineering data sheets, the testimonial letters and our rush bulletins closed many an order for them. And they remarked especially about the convenient form in which the data came to them.

"I've been taking typewritten matter, clippings from trade papers and illustrations from various sources, — combining them on one sheet and reducing them to a standard size on the PHOTOSTAT. These standard sheets fit into the sales books and are easy to refer to. Before, the salesmen had sheets of so many different sizes that they quickly lost track of most of them.

"The advertising department also told me today that the PHOTOSTAT has reduced the time spent on layouts in that department by 50 per cent."

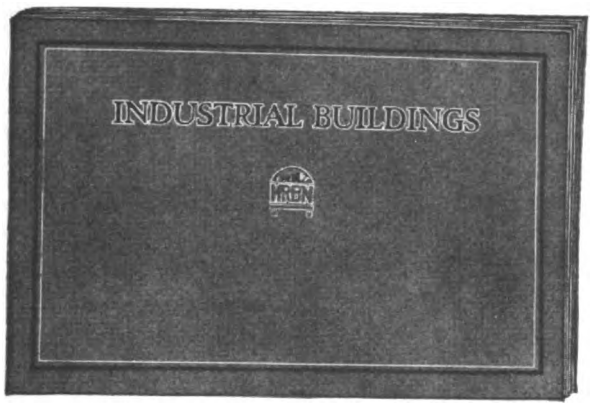
The PHOTOSTAT is a Photographic copying machine. It makes photographic facsimiles directly on sensitized paper.

In our booklet, "A Good Word for the PHOTOSTAT," many companies in widely different industries tell of savings which the PHOTOSTAT has made for them. Send for it.

PHOTOSTAT CORPORATION
299 STATE ST., ROCHESTER, N. Y.

88 Broad St., Boston
119 W. Madison St., Chicago
209 Leader Bldg., Cleveland
7 Dey St., New York City
510 No. American Bldg., Philadelphia
317 Third Ave., Pittsburgh
429 Monadnock Bldg., San Francisco
601 McLachlen Bldg., Washington.
Executive Office: Providence, R. I.

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A Personally Conducted Tour *of* Inspection *for* Factory Owners

WOULDN'T a trip through twenty-five modern industrial plants, including factories, foundries, forge shops, machine shops and power plants give you some good ideas to use in your own plant?

That is practically what *Industrial Buildings* gives you, for it contains not only exterior and interior illustrations of twenty-five modern industrial plants, but floor plans, cross sections and plant layouts, as well as interesting facts about every one of the plants illustrated.

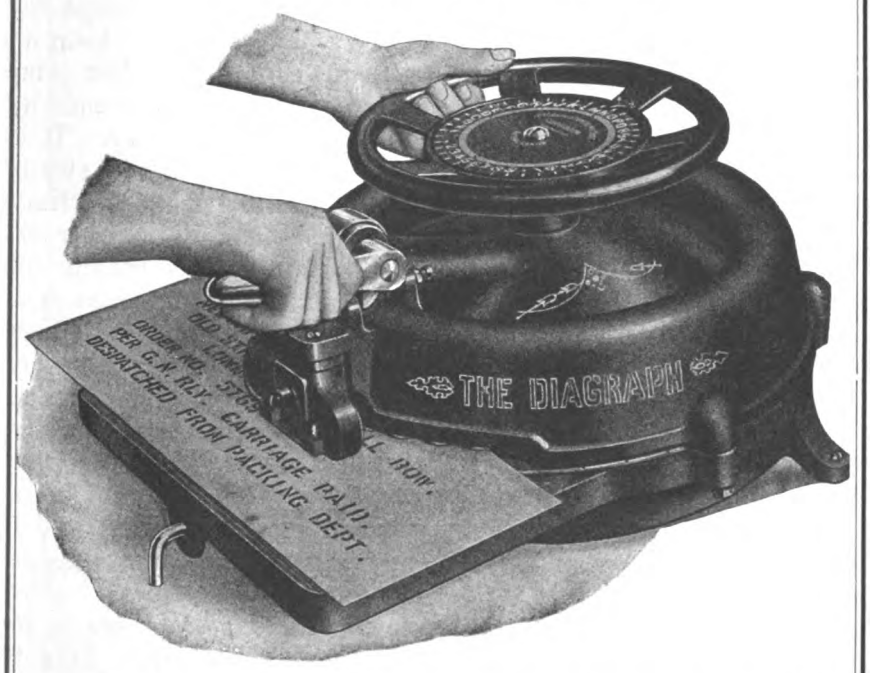
We are offering to send a copy of this booklet gratis to any factory owner or executive.

Write us today for your copy.

MILLS · RHINES · BELLMAN & NORDHOFF
Engineers
TOLEDO · OHIO

33

Why Not?



WHY NOT put your shipping department on the same money-saving basis as the rest of your business? Buy a Diagraph Stencil Cutting machine—with it you get the positive assurance that shipments leave your plant bearing clean-cut, legible addresses that protect you against your share of the million-dollar transit losses which shippers pay each year. More than 20,000 Diagraphs in use. Try one at our expense.

DIAGRAPH STENCIL MACHINE CORP.
1626 So. Kingshighway Blvd., St. Louis, Mo.
Branches in all principal cities—see phone book.

LEWIS-SHEPARD MEANS LABOR SAVING



$12,140.00 reduction in annual overhead costs from an initial investment of $1,798.00

—is the exact total saving a recent investigation showed that the Lewis-Shepard System of interior transportation (of which the JACKLIFT Elevating Truck is the basic key) is making *every year* for four New England manufacturers;—a saving that is being felt, in proportion, by every one of more than 3,500 JACKLIFT users throughout the country.

Don't these figures interest YOU?

The JACKLIFT is but one of a complete and efficient "family" of Lewis-Shepard products for speeding up and economizing the handling of goods, and mobilizing floor space.

You have a handling problem, no matter what your business is. It may be a problem of horizontal handling. It may be a problem of *vertical* handling. It may be both. But with one or more members of this Lewis-Shepard "family" you can solve it completely, and turn much of what is now "overhead" into *profit*.

Will you let one of our engineers show you exactly how? No obligation. Write us.

LEWIS-SHEPARD COMPANY
568 E. First St., Boston (27) Mass.

Representation in Principal Cities

Manufactured and sold in England and Canada

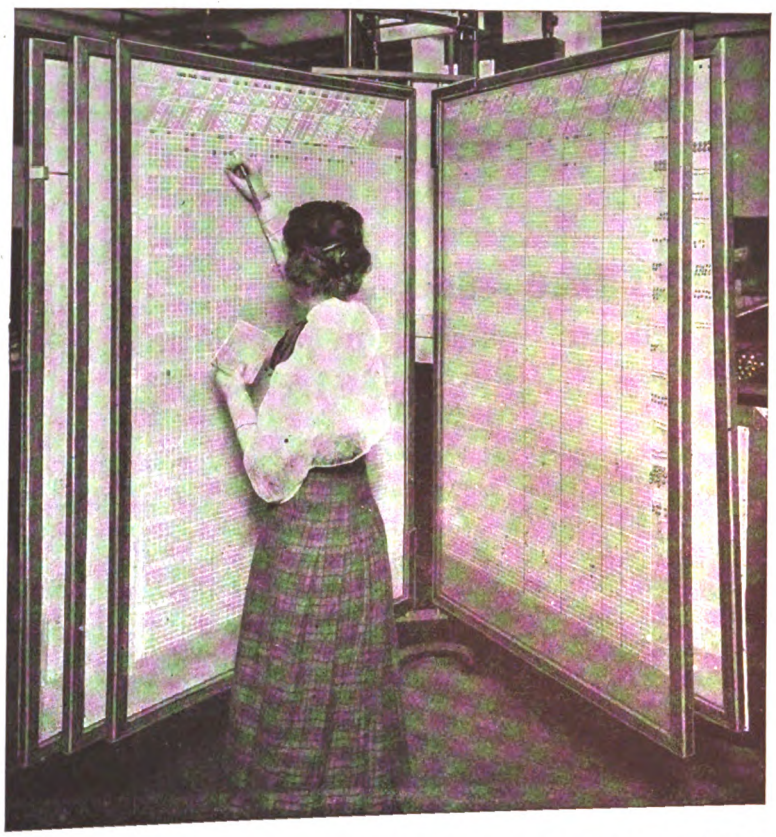


Our Barrel and Case Truck

No necessity for extra "helpers" if this truck is used. One man can easily and safely move any of your barrels or cases. With it, shipping clerks often do both the checking and moving alone. *Write for full particulars.*

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CONTROL BY GRAPHICS



WHATEVER ELSE IT DOES

Complete Graphic Production Control should show:

A. Raw material or stock on hand

B. Work ahead of machines

C. Progress of each lot or order through the processes or departments

The progress of hundreds of orders can be graphically kept up to date in a surprisingly short time. Usually no extra help is needed. The boards illustrated above are simple to operate and tell the whole story at a glance.
This plan is only one. Each control problem requires its own workout.

GRAPHIC SCHEDULING OF PRODUCTION

1. Prevents overloading of machines or departments.
2. Protects customer from wrong delivery promise.
3. Saves cost of looking up lost orders and answering complaints.

Send for our analysis blank
"GRAPHIC PRODUCTION CONTROL"
It's sent on request without obligation.

EDUCATIONAL EXHIBITION CO.
527 Custom House St. **Providence, R. I.**

(Continued from Page 48)

very thing, and some one had come along and told him that they would give him a job picking up bricks that would stay in position when placed, and that when the day's work was done he would have built something—the offer would have been doubtless accepted. The day worker accepts the offer of the agitator who tells him that they are going to build something. *Building* something appears more reasonable than sitting all day and accomplishing nothing visible.

A shop employing two thousand people, with a day force of several hundred, was the object of a unionizing campaign during the war. Ninety-five per cent of the day workers enrolled in the union; only about two per cent of the piece-workers enrolled. The organizing was done during working hours. The day workers welcomed anything that would break the monotony of "picking up the brick." The piece-workers were too busy in their own small manufacturing to give ear to the ones doing the agitating.

There is no room for agitation where there are *fair* working conditions and contented workers. Still, abuses will creep in, and thus with piece-work. There is one abuse of the piece-work system that should be mentioned, and that is, the fixing of rates either too high or too low. In the first case, the worker needs to kill time in order to avoid turning in too much work, thereby causing him to lose interest and the time to lag on his hands. In the second, a feeling is created that it is useless to race against a rate that can not be attained. In this case the worker usually attempts to "kill the job" at the rating offered, thus breeding discontent.

The former abuse is often caused by the foreman setting the rate and guessing at the standard. Therefore, if the workman turns in an excessive amount of work, and his pay slips amount, the foreman does not glow with pride in his efficiency. It is to his interest to hold the worker within the accepted day's pay, as set, in order to protect himself. The setting of low piece rates, too, is sometimes the work of a parsimonious foreman, who is a misfit, or else the work of clerks who can time the actual extent of an operation but who fail to estimate closely on unavoidable delays. In either case discontented workmen result.

In estimating the effect of monotonous employment on the worker, the subject could well be discussed among those interested in the employing of help. The effect on the labor, turn-over, production, and the freedom from labor troubles in shops where fair piece-work rates have replaced the deadening method of working by the day, might prove a revelation.

In summing up the entire subject, it is certain that the day goes fast when racing *against* time, but runs sixty seconds to the minute and sixty minutes to the hour when *working with it.* It is the experience of most piece workers that the clock seems to race ahead of one. It keeps the worker busy trying to keep up with it, especially when some little, knotty point comes up that delays production. It is then a case of skilful, steady industry to make up lost time. When the machine is contrary, work behind, clock racing, the worker's "little, one-man business" making no money, there is interest in every fibre of that employe's being. He has no time to think of monotony.

What does the day worker care about delays? The whistle will blow sometime, and if the time until it blows seems unusually long, as it often does, what else is there to do but be discontented? It gets tiresome picking up and laying down the same old, brick, day after day.

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DAYLIGHT-EFFICIENCY



CORRUGATED WIRE GLASS

Imagine a Sheet of Corrugated Iron with all its strength, yet possessing the transparency of glas

PRODUCES DAYLIGHT
DAYLIGHT PROMOTES EFFICIENCY

← Old skylights in this building replaced with CORRUGATED WIRE GLASS

C. W. G. most economical and durable material where LIGHT is required.

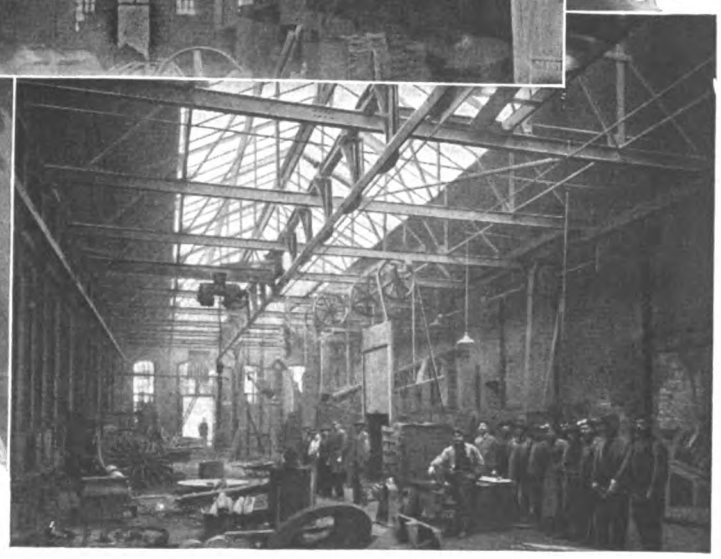
C. W. G. is easily and quickly installed by ordinary labor. Easily kept clean.

No upkeep— nothing to wear out
No breakage from expansion or contraction
Each joint is an expansion joint.

Consider Advantages of
Corrugated Wire Glass
Over All Other Kinds

COMPARE COSTOF C. W. G.
STRUCTURES WITH OTHER KINDS

Submit your rough detail for working drawings—no obligation



Note difference in LIGHT in the interior of this shop AFTER C. W. G. was installed.

C. W. G. Used

WHEREVER DAYLIGHT IS REQUIRED

in old or new buildings.

C. W. G. IDEAL FOR

ROOFS	MARQUISES
SKYLIGHT	CANOPIES
SIDE-WALLS	OVER AREAS

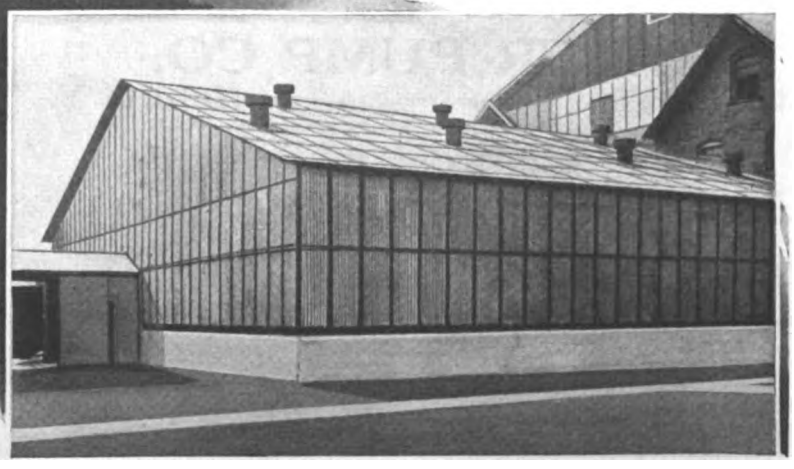
ETC.

Engineering Advice free

SEND FOR CATALOG No. 7-C.



C. W. G used throughout this all glass building. Interior and exterior views.



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TABER PUMP CO.
308 Elm St. *"Pump Specialists"* Buffalo, N. Y.



Engineering Methods Applied to Agriculture

(Continued from Page 15)

such basis, alines himself with an inferior branch of endeavor. I can think of no more grievous error. A person may take up manufacture, mercantile business, mining or any profession in a thoughtless and uninformed manner and accomplish nothing worth while, just as he may do with agriculture. But there is no line of human endeavor in which he must be so broadly informed or of quicker and more accurate judgment than in agriculture, if he is to make a success of it as measured by the possibilities of the field.

Curious as it may seem to many, broader engineering principles must underlie, and they must be more all embracing, in successful agriculture than in probably any other pursuit, and to these must be added something of substantially every other branch of knowledge including an appreciation of the mysterious and wonderous works of God in nature.

How much is it appreciated that an agricultural school, if properly conducted, is the most perfect exemplification of an engineering school? Where the science of agriculture is properly taught, it must be along the most basic engineering lines. A successful agriculturist must be grounded in everything required for a successful engineer, with many other things of which the latter need have no knowledge. He must *know* machinery of the most diverse varieties, he must *know* construction in almost all its phases, he must know how to lay out work under the most changing conditions, he must know the handling of men when carrying out almost every line of work, he must have records of his fertilizing and crop relations with engineering precision, and his records of the many important matters relating to his cattle and other animals must be of a detailed character.

Agriculture pictures to most people merely the raising of a few crops and some cattle. But it will be seen from the foregoing that properly developed agriculture means controlling of the forces of and utilizing the materials of nature for the most direct benefit of man and the organizing and directing of human activities in connection therewith under the most complex conditions, if the natural resources of our country are to be intelligently developed. Everything must be done according to fully worked out and absolutely flexible engineering plans with full appreciation that tomorrow may require radical changes.

The products of Agriculture of our country amount to about thirty-five percent in the total money value of all the products of industry, and yet *the substantial prosperity of the nation must be supported by this thirty-five per cent.*

By the application of engineering methods to the development of the acreage of this country now in agricultural use, the products of agriculture can be several times multiplied, and I predict that with further education in agriculture we can confidently look forward to such increase.

There is a field for young men of good common sense and engineering bent with a love for the great out doors, in agriculture second to no other endeavor in the world. If we emphasize the great out doors there is certainly nothing to be compared with Agriculture, but the man must primarily see things along engineering lines.

One of the "Hundred Other Causes"

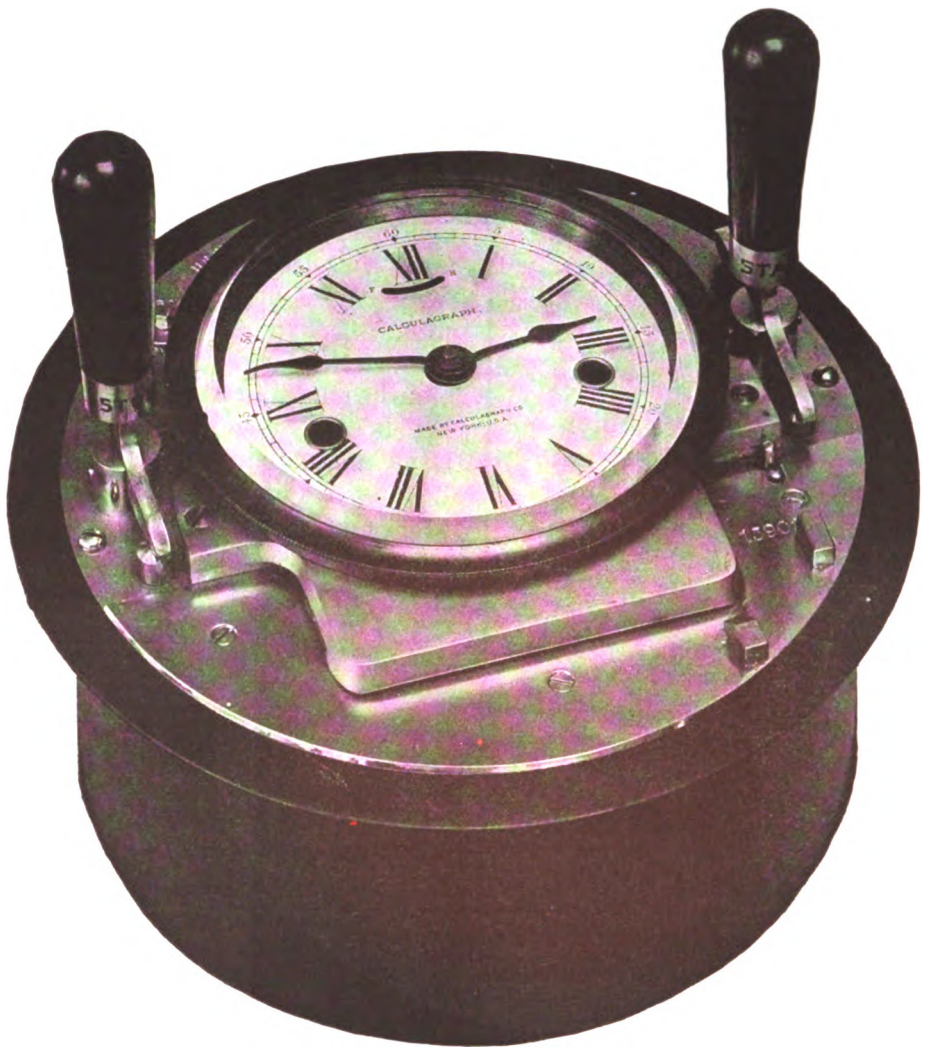
(Continued from Page 23)

dustrial plants have their surplus and excessive stocks moved, release the space previously taken up by obsolete equipment and other materials, and discontinue paying storage insurance and other charges on unnecessary goods, the sooner will we be able to overcome one of the obstacles in the way of getting back to normal; namely, the non-disposal of such equipment on hand due either to inconsistent purchasing, change in manufacturing methods or causes of a similar nature.

Some intelligent business

(Continued on Page 54)

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18th Century Methods of Time Recording Will Not Meet 20th Century Competition

The business methods of ancient Egypt were probably well suited to their time. So, too, were the shop practices of the 18th and 19th century.

But neither will do today.

Time recording machines which stamp the job ticket with "time started" and "time stopped" only, belong to the past. They are but half-way efficient.

The Calculagraph prints on the job ticket not only "time started" and "time stopped" but also the *elapsed time*. It eliminates the work of subtracting one set of figures from another. It saves the time of clerks. And it gives a printed record that is indisputable, for, unlike the human mind, the machine cannot make mistakes.

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Some Reports Now Ready are

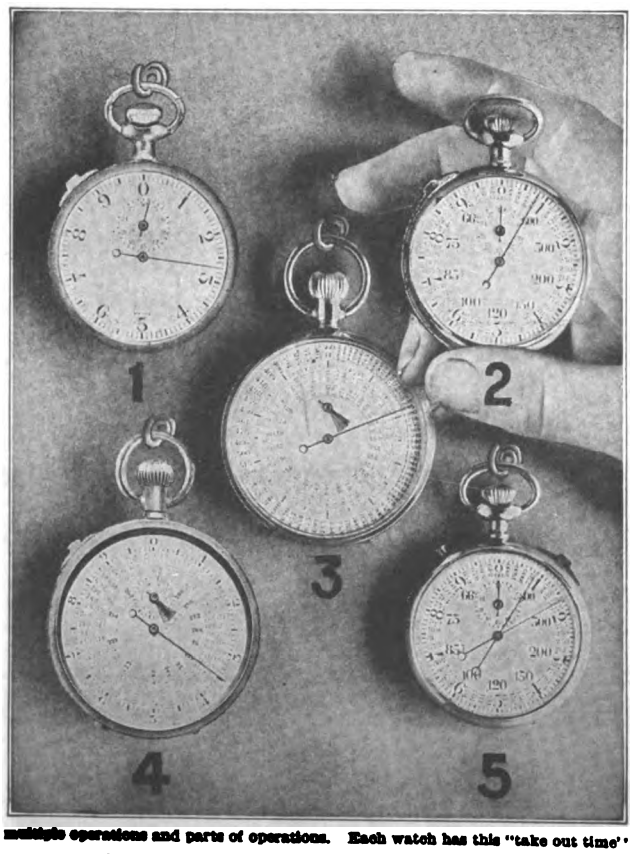
- Foremen Training
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At last time study watches have been developed to where they can apply to every job in the plant—do their own calculating for production figures—give you direct results with absolute accuracy. Your job may be a simple time analysis—or a complex problem in piece work rate setting or a bonus system—there's a watch in this illustration that exactly fits your needs.

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You can use any one of these watches for every kind of time study. But each has special features that facilitate certain types of work. No. 1 has a plain decimal dial with the "take out time" feature. No. 2 has, in addition, direct readings in production per hour up to 1 minute jobs. No. 3 carries the same readings up to 5 minute jobs, in seconds and half-seconds. No. 4 gives all readings in decimals and shows production figures up to 3 minute jobs with a special arrangement for timing jobs up to 30 minutes. No. 5 is the "split hand" watch with the "take out time" improvement which now permits careful studies of multiple operations and parts of operations. Each watch has this "take out time" feature.

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Pick the watch that fits your job. We will gladly send it with a descriptive pamphlet on its use to any responsible concern on approval. Put it to any test you wish—prove its advantages in facilitating the work and guaranteeing absolute accuracy. Each watch is backed by our unlimited guarantee. Write us today for the instrument that fits your requirements—or in case you desire our advice, tell us the class of work you are doing and we will ship you the watch to meet your needs. No obligation. Write today for detailed pamphlets, or for pamphlet entitled "More Jobs for the Factory Stop Watch."

MORTIMER J. SILBERBERG CO.

Peoples Gas Bldg. Pioneers in Manufacture and Sale of Time Study Watches **Chicago, Illinois**

(*Continued from Page 52*)

men will follow this theory: "We have $100,000 tied up in idle equipment, obsolete and surplus stocks in our plant, of no use to us now but there *may* be a market for it, say in six months, so let us hold on to it until that time instead of disposing of it now for $5,000 as junk." Typical, isn't it? When the end of the six months comes around, the market is still uncertain, so the issue is invariably postponed. Let us assume that the man who makes the above statement is producing vigorously a marketable article and needs more room for production. Was he producing in the space taken up by the storage of the unused equipment and supplies during the previous six months? Second, did he spend valuable time scrutinizing periodically the trade journal for a market for the equipment? He did, or one of his $2,500 assistants' time was taken up in this way. Was he carrying this "padded" asset on his books when he should have cleaned house, taken the loss and put himself on a more sound and economic basis for future development? Has he been shifting the equipment in question around from place to place within his plant to make way for new floor layouts, new development work, etc.? There is but one answer—Five dollars on the correct side of the ledger is worth $100.00 in obsolete and idle equipment!

Mr. Executive, you will travel to your suburban place tonight and, as a true home loving American, will look perhaps for something to do to make your home a more beautiful place to live in and incidentally, put your home on a more efficient footing. It may be that you will have your house attendent clean up the cellar bins, have him start to calcimine the walls around your heating plant or clean your cellar of all rubbish. This is the sermon—You are particular to *clean house,* but are you as anxious to *clean factory!* A "Hundred Other Causes"—and this is one which Mr. Hoover did not have time to emphasize.

Perhaps the erroneous attitude which some men are apt to take on the subject could be changed if it was demonstrated to them that Salvage Sections, By-Products Divisions or Reclaiming Departments are doing the unheard-of these days: making big advances over the pre-war slip-shod methods of sorting scrap, disposing of surplus stocks, and finding ways to utilize obsolete materials. It would pay to become familiar with figures showing amounts of savings due to the sorting and selling of scrap metal, rags, paper, barrels, boxes and other materials of this nature last year in industrial plants throughout the country. The enormity of this item alone is surprising.

Assuming that the Executive has been sold the idea of the Salvage Department and that sufficient interest is aroused to assure his cooperation in the work, it naturally follows that he would want to know what kind of Salvage Department would best adapt itself to his plant's needs. In general, the Salvage Department or By-Products Division that would come nearest to perfection would be one showing increasing sales of obsolete and surplus stocks of machinery, equipment and supplies for the first few months after the system has been inaugurated, and a decrease in sales after this peak has been reached, the loss being offset by increases in the quantity of reclaimed goods returned to stock for future use and the finding and remedying of the cause for such waste.

Any plant can sell surplus and obsolete materials provided there is a favorable market, but how many Salvage Departments are so highly organized that they can readily show in their reports decreasing sales due to the volume of uses found within the plant for articles which had previously been declared available only for the junk dealer? What a waste there was in the coal industry until some genius came along and discovered the many uses for the by-products of coal with which we are so familiar today.

To suggest a definite, nonflexible organization applicable to any and all companies to carry on salvage work is impracticable for the following reason: When such a Depart-

(*Continued on Page 56*)

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Brains! My Boy, Brains!

I asked one of the executives of a well known automobile company to give me the major reason for the great success which his company had achieved during the last two years. Other motor companies had been placed in the hands of the receivers and those which had not, were making very little progress. Yet this company which manufactures two fairly high priced cars had tremendously increased its sales and was earning big profits. Its plants were working overtime, its output was less than its sales, and every man in the organization was working under pressure, yet contentedly.

His answer is the headline above "Brains! my boy, brains!" and this is what he added. "Almost every industrial organization in this country had devoted most of its effort and most of its money to the development of its machinery and its tools, but altogether too little of either to the development of its men. Our company has been successful because we have developed the brains in our organization. We want men who know enough to get the utmost out of the equipment which we have perfected. Our sales have increased largely because we are producing a car of quality at a cost low enough to permit a selling price which the average customer will pay. And he does not hesitate to pay it because we have been and we are giving him full value in appearance and workmanship and reliability.

"This has been made possible only by the brain power of our organization. Other companies have just as good machinery and equipment as we have, but they have not developed the man power to operate it.

"Our entire organization has studied methods and principles which have been used successfully elsewhere and we have applied them with certain ramifications to our processes. The brains have won."

The Industrial Extension Institute is training men in that particular company and in hundreds of other well known progressive manufacturing organizations. The Institute exists only to help in developing men to fill industrial management positions.

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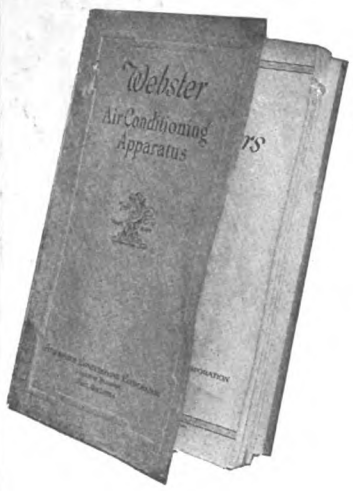
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Air cleaned and cooled by passing it through a dense mist.

CIRCULATING PUMPS FOR AIR WASHER
These 6-in. pumps are in duplicate so that one always is in reserve, and are used to force the water through the sprays.

(*Continued from Page 54*)

ment is organized, the Supervisor is unaware of the nature or number of problems which will confront him. There is no definite path over which to travel and therefore, as various problems arise, the original nucleus of a few members expand until there is sufficient personnel to cover the supervision, sorting, selling, research and reclamation work pertaining to the obsolete and waste products.

In choosing a Supervisor for this work, however, one point should be borne in mind; namely, that the Department is to be one of helpful suggestion to allied departments rather than criticism that would tend to antagonize and incur a lack of co-operation of such closely related departments as Stores and Purchasing. The Supervisor should be one who would appreciate the above fact; a man who has had wide selling experience and is familiar with the various waste markets. He should also possess that initative and ability necessary in deciding whether or not an article should be sold as scrap, held for a more favorable market or sent to the machine or carpenter shop, as the case may be, for repair and re-use.

In general the following are a few of the more important functions of any Salvage Department:

(1) *Sorting and Selling of Scrap and Obsolete Materials*—Volumes have been written, it seems, on the benefits derived from this particular phase of Salvage work and such an organization's first duty is to ascertain when and how to sort and bale such materials as waste paper, rags, metals, etc., what portion of the sorted goods to retain in stock for future use, and where to sell obsolete materials. Second hand and junk men have repeatedly admitted that if plants were to do more segregating and grading and less selling of *mixed waste*, they, the junk men "would have to go a little while longer before ordering the new limousine." If the biggest prices are to be paid by the junk dealers, they insist that commodities come to their yards in the form that they can resell it. It is also equally essential that investigations be made before buying equipment to carry on this function of the Salvage Department, in order to determine the best type of baler for paper and scrap metal, whether the purchase of a magnetic separator, electro magnetic hoists or acetylene cutting equipment is warranted. It is in this function of the Department that a knowledge of second-hand and waste markets is absolutely essential. We are forced to admit that depression has tarried with us a while and we are now experiencing an era of the survival of the fittest. There never was a more opportune time to clean out our surplus and obsolete stocks and refill our depleted treasury. Incidentally, we should not lose sight of the fact that in many instances, the employees themselves have been the market for obsolete stocks.

(2) Another phase of Salvage procedure heretofore barely touched on and unattempted in many organizations, is the enlarging of the scope of the department to cover the *Investigation of Causes for Scrap* and the elimination of these causes. It is obvious that if this work were carried out to 100% efficiency, the ideal year would show hardly any sales of scrap. The second-hand and junk dealers business is safe, however, for just as long as those in charge of industrial plants fail in the endeavors to acquaint themselves with the causes and the elimination of waste, just so long will the scrap market reap its share of the fruits of such negligence.

(3) Returning Material to Stores—In changing the location of departments or making entirely new plant layouts there are often times materials such as electric and plumbing supplies and miscellaneous equipment left over that could be used over again on new construction. The Salvage Department should return to the Stores Department such items as pipe that can be recut and rethreaded, valves, nuts, lumber, etc. and the Stores Department should issue a credit to the Salvage Department for this class of material. In emergency cases, such material may be requisitioned from the Salvage Department direct to any one department, the record, however, being cleared through Stores.

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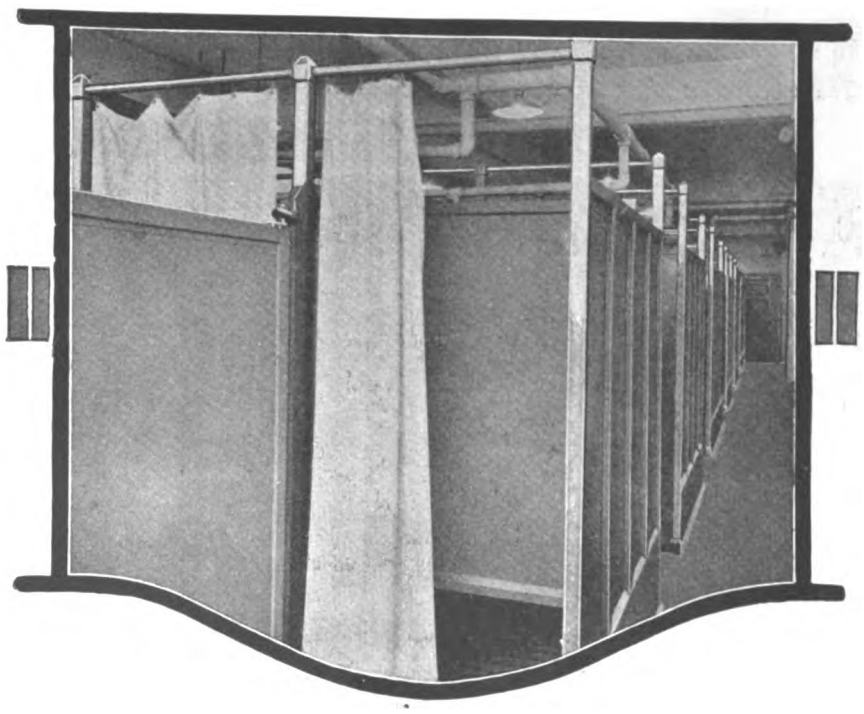
(4) *Incoming Packages, Containers, Returned to the Original Shipper*—Most plants receiving goods in carboys, jugs and similar receptacles are enabled by an agreement with the shipper to return such containers for credit. Although such agreements should be handled by the Purchasing Department, it is nevertheless one of the Salvage Department's main duties to see that none of this class of material is allowed to accumulate around the plant and it should go into the more obscure parts of the factory to locate "forgotten" containers. It is surprising how this item will accumulate where there is no agency to follow the matter up.

(5) *Disposal of Second-Hand Machinery and Equipment*—Besides disposing of obsolete and surplus materials and supplies, the Salvage Department should aim to reduce and keep to a minimum their account of Second-Hand and Unused Machinery and Equipment. It often happens that equipment released by the Maintenance or other Departments is not readily marketable and its disposition is left to the discretion of the Salvage head, he to decide whether to scrap the equipment and sell perhaps at an apparent loss, or hold the material for a more favorable market. In any event, some knowledge is necessary for the care and handling of idle equipment, such as the application of rust resisting surfaces to metallic equipment to be stored for any length of time.

It is said that "Advertising Pays," and while the work of the Salvage Department would be seriously hindered if it were not for the notices of surplus stocks and machinery sales appearing in Trade Journals and circulars sent out by the various trades, on the other hand the greatest amount of discretion should be exercised in this matter. The advertising of a considerable amount of equipment is often likely to cause embarrassment in one way or another. Many examples of this have stood out very plainly during the strenuous days just passed, when every little rumor of the wholesale disposal of surplus stocks was bound to be interpreted by Wall Street as spelling disaster for the particular concern thus advertising; with the result that the stock of that concern was hammered below its actual value. This is only one of the effects of the unwise distribution of information relating to surplus and waste materials. The Government has advertised very successfully its surplus war stocks and there is no reason why under normal conditions a clearing house should not be inaugurated in every industry to co-operate in moving salvage goods.

The Salvage Department holds rather a unique position in its relation to the other departments. If properly organized, it is the first to be called upon, for example, if a department head needs additional second-hand office equipment, and it is the last to be called upon when surplus and obsolete stocks are to be disposed of. As pointed out before, the aim of the department should be constructive—the only sure way to insure the co-operation of the other divisions. For instance, there must be a close touch with the carpenter and other maintenance departments for it is here that unused equipment is sent for the necessary changes and reclamation work to put it back into service.

Perhaps if Mr. Hoover had designated "Salvage" as one of the most important divisions of a manufacturing organization, his word would have been accepted as fact and arrangements would have been made immediately in most concerns for this necessary work. We must content ourselves, however, in believing that this was included in the "Hundred Other Causes" referred to in the beginning of this paper, and anticipate that in time such work will gain for itself a rank with Production Planning, Engineering, Raw Material Control, Safety, Industrial Relations and the other important sub-divisions of an industrial enterprise.



For Willard

IN the plant of The Willard Storage Battery Co., Cleveland, Sanymetal Toilet and Shower Compartments are installed. Willard engineers chose Sanymetal because of its known resistance to wear and tear, rugged construction, and attractive design. Sanymetal glazed Office and Factory Partitions display the same fine qualities.

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Sanymetal Office and Factory Partitions are made in standard units in two designs, to fit any height or floor space. They are glazed as desired or, for ordinary shop construction, fitted with steel sash and glazed. Trimmed and finished the same inside and outside. All bolts, screws, and fastenings carefully concealed by molds. Rigid, permanent construction—but adapted to change in layout at any time. Ask for Catalog No. 4 on Office and Factory Partitions.

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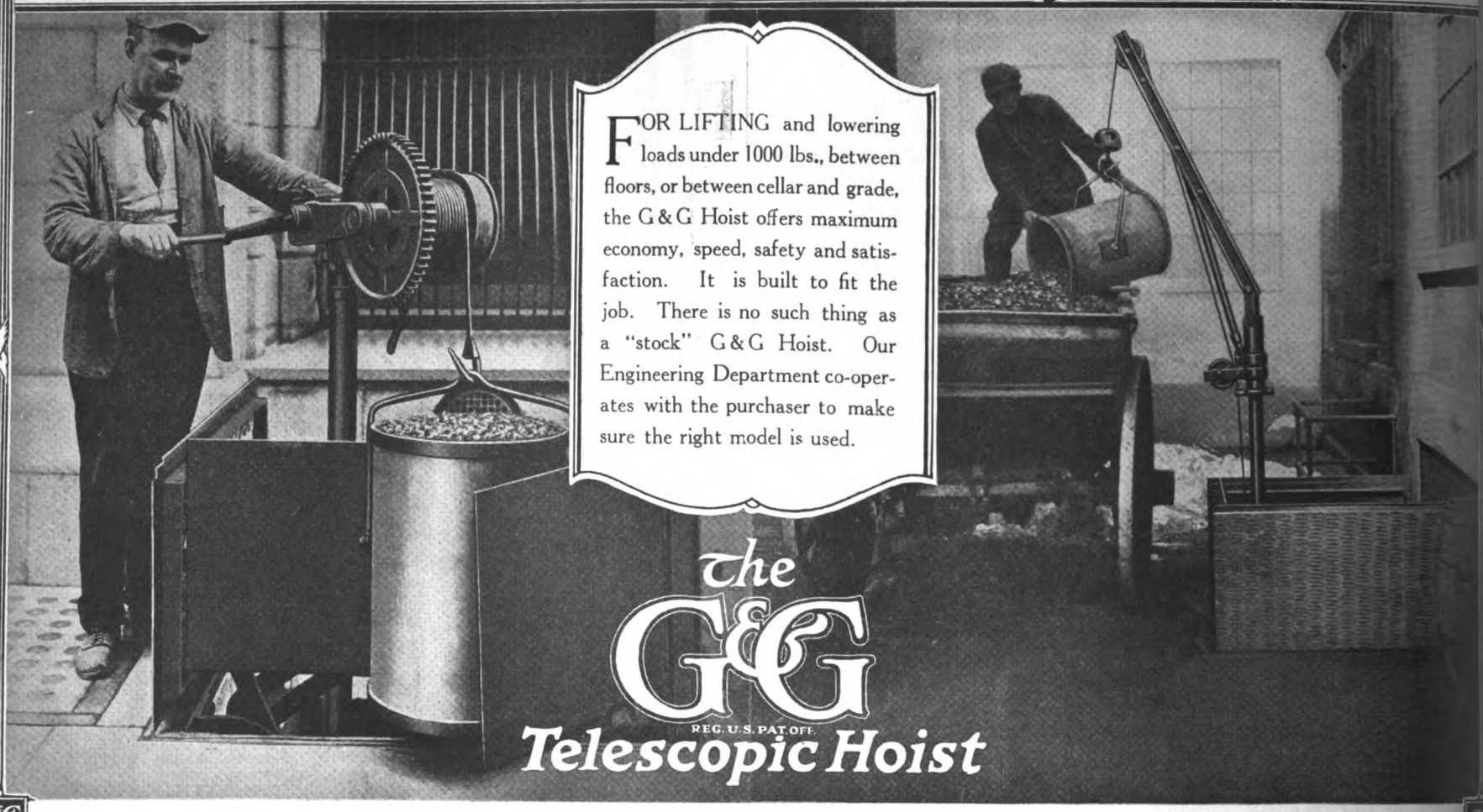
Typical Mill Office



Built of Sanymetal

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Use this Hoist for ash removal and light factory loads



FOR LIFTING and lowering loads under 1000 lbs., between floors, or between cellar and grade, the G & G Hoist offers maximum economy, speed, safety and satisfaction. It is built to fit the job. There is no such thing as a "stock" G & G Hoist. Our Engineering Department co-operates with the purchaser to make sure the right model is used.

The G&G Telescopic Hoist

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Showing how one man unaided, removes ashes with this Hoist

(Hoists illustrated can be furnished electrically or manually operated)



View of Hatch. Sidewalk Doors closed and automatically locked.



As hoisting head is raised, Sidewalk Doors automatically open—alarm bell rings.



Doors opened and automatically locked. Operator ascending iron ladder to sidewalk.



Operator "hooking" a G&G Standard hoisting Can with Swing Bail.



Operator "hooking" a G&G Standard hoisting Can with Swing Bail.



Raising filled Can without leaving sidewalk.



Swinging hoisting head (on ball-bearings) to deposit can on sidewalk. Can pushes gate open.



Can deposited on sidewalk without lifting. Gate automatically closes.



Four filled Cans raised without leaving sidewalk.



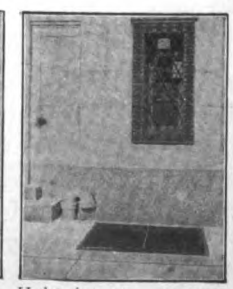
Lowering empty cans to cellar. Hoisting handle does not revolve.



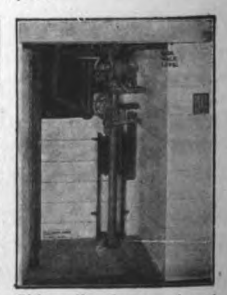
Operator descending iron ladder to cellar level.



As hoisting head is lowered, doors automatically close—alarm bell rings.



Hoist in area—compact—out of the way.



Sidewalk doors closed and automatically locked.

Investigate the time and money saving G & G Hoist. Write today for latest pamphlet No. 140 showing factory uses.

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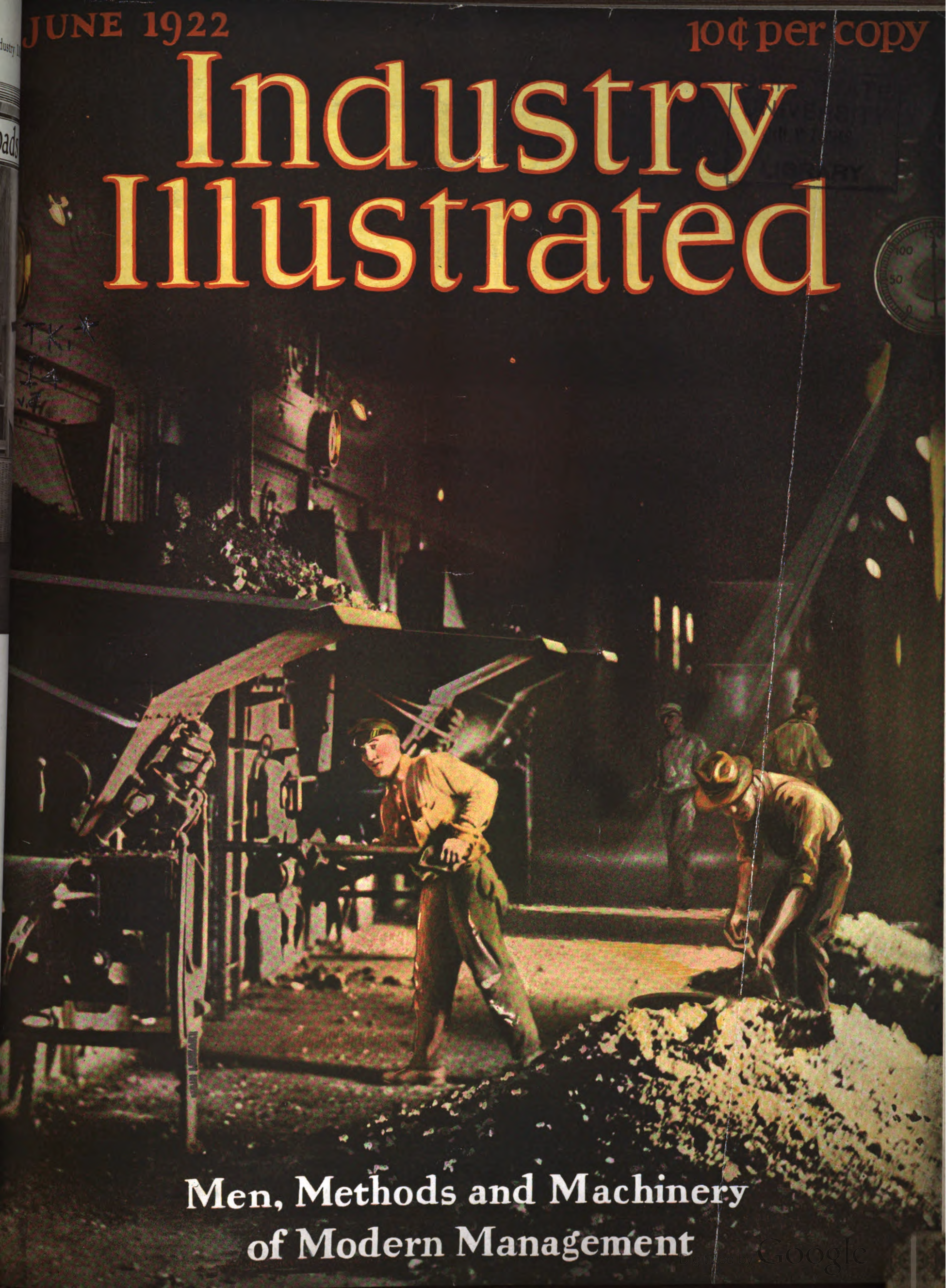
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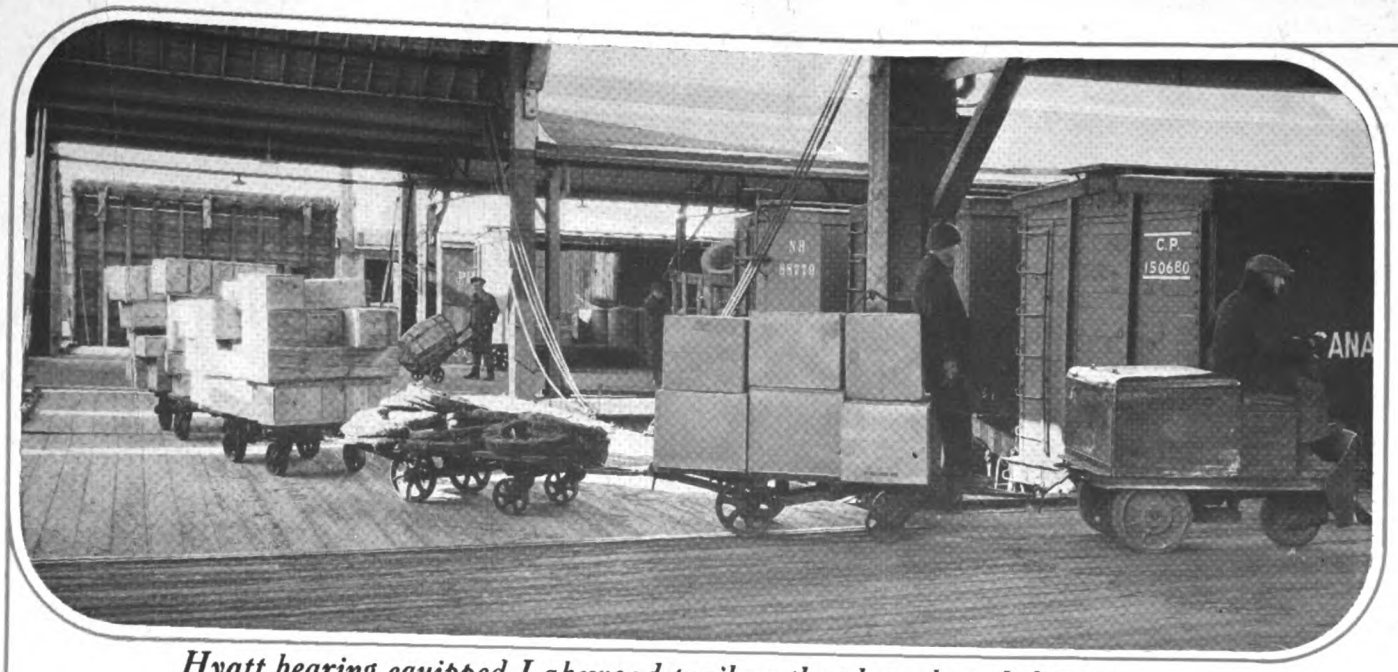
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Industry Illustrated



Men, Methods and Machinery of Modern Management

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Handling Costs at Cedar Hill Reduced by Hyatt Bearing Trailers

At the big Cedar Hill freight terminal of the New York, New Haven & Hartford Railroad, 320 Hyatt equipped trailers are doing their part in handling freight at the lowest cost per ton.

These Hyatt bearing trailers have been in service constantly since November, 1920, with no bearing replacements, and it is to be expected that the bearings will continue to give this fine service throughout the life of the trailers.

When these trailers have to be moved by hand in making up trains, or when pushing them into the cars, one man easily handles each truck, instead of the two men necessary on the few plain bearing trailers around the yard.

These easy running qualities are also an advantage when the trailers are pulled by tractors because storage battery strains are eliminated, noonday boosting of batteries is not necessary and each tractor can handle more trailers.

As Hyatt bearing trailers operate for three to four months on one application of lubricant, a real saving in material and labor is realized.

Reduce *your* handling costs to a minimum, specify that your manufacturer furnish you with Hyatt equipped trailers.

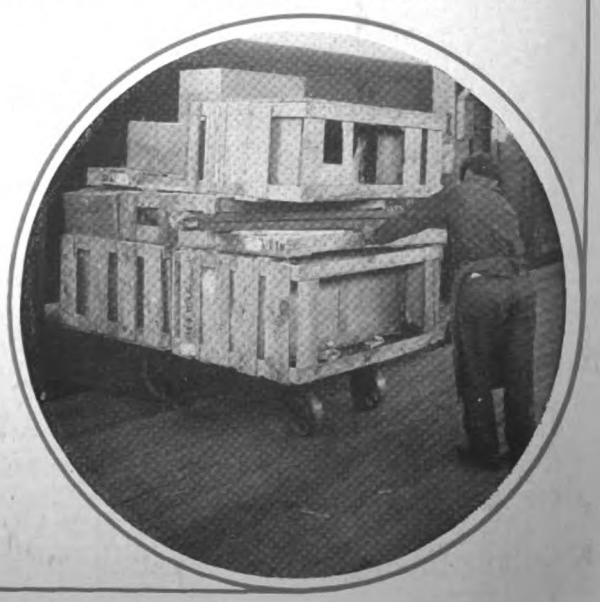
Hyatt Roller Bearing Company
Industrial Bearings Division
New York, N. Y.

Motor Bearings Division
Detroit

Tractor Bearings Division
Chicago

Pacific Coast Division
San Francisco

USE HYATT BEARINGS ON YOUR LINE SHAFTS TOO
BULLETIN 125



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INDUSTRY ILLUSTRATED

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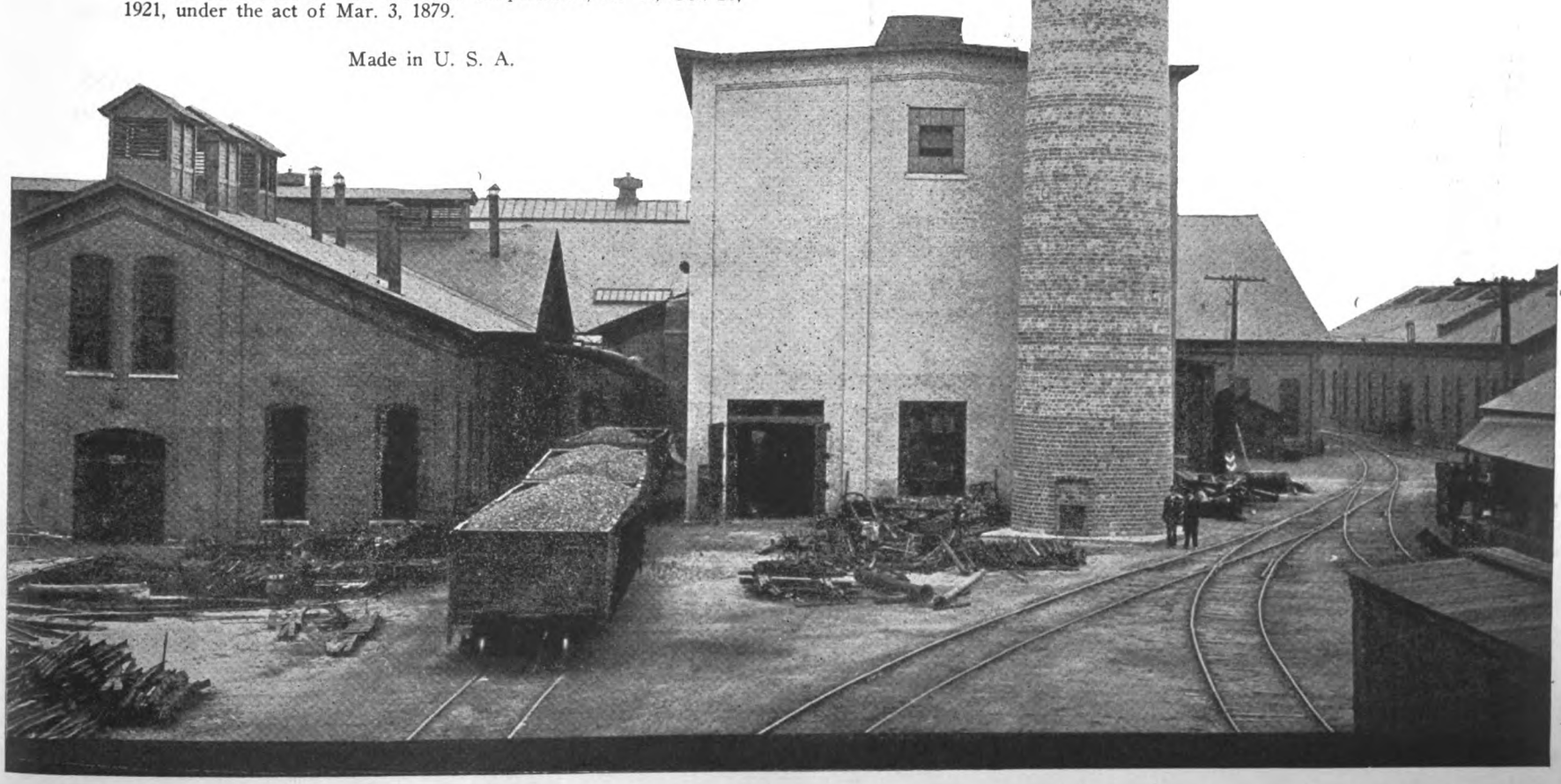
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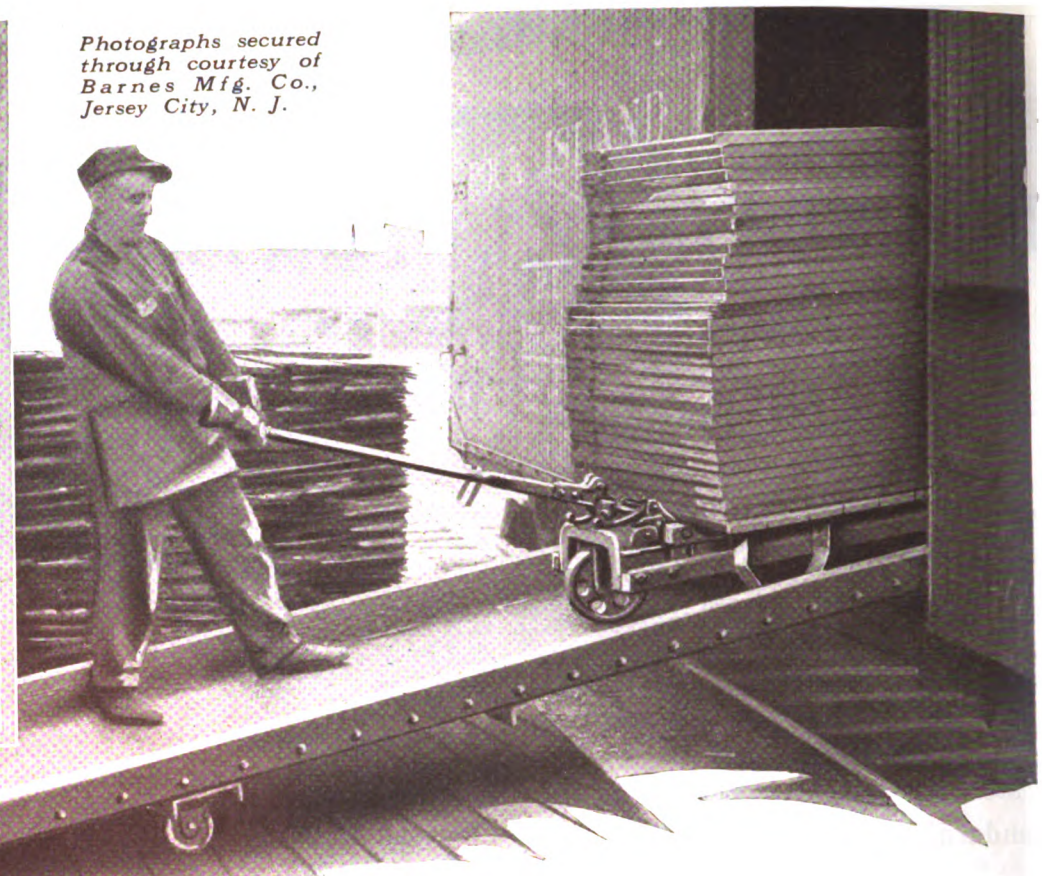
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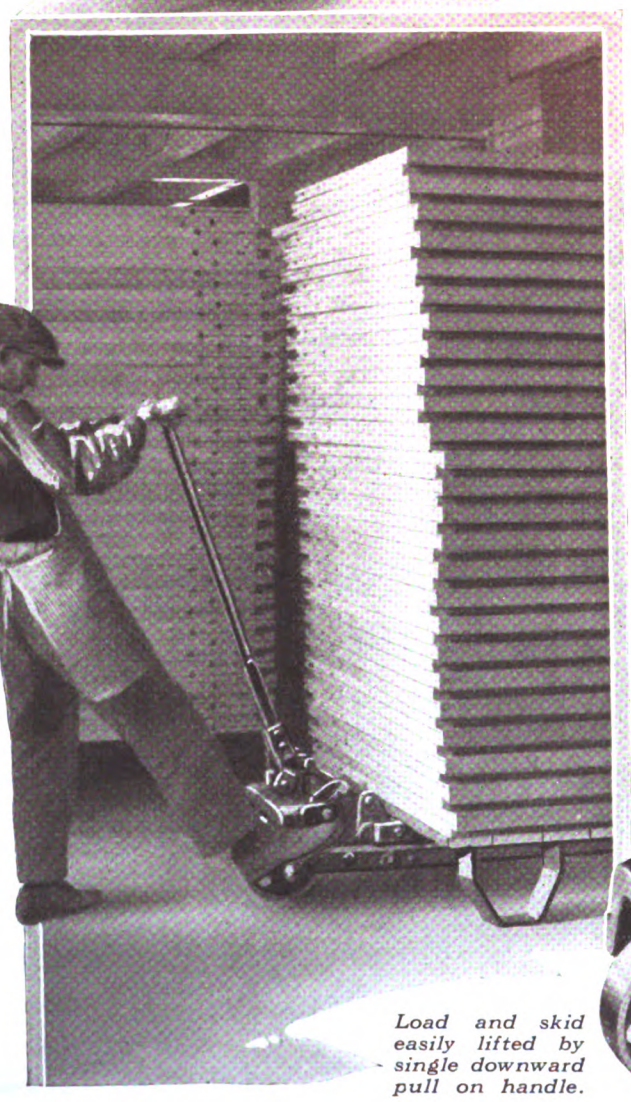


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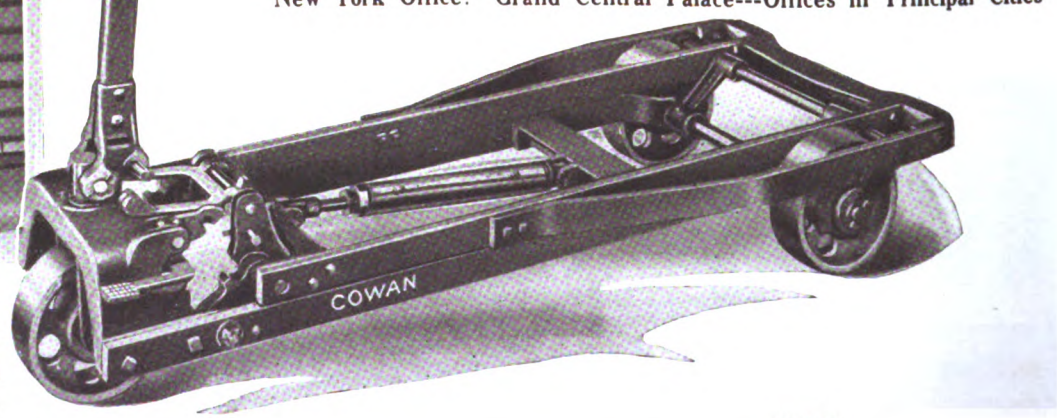
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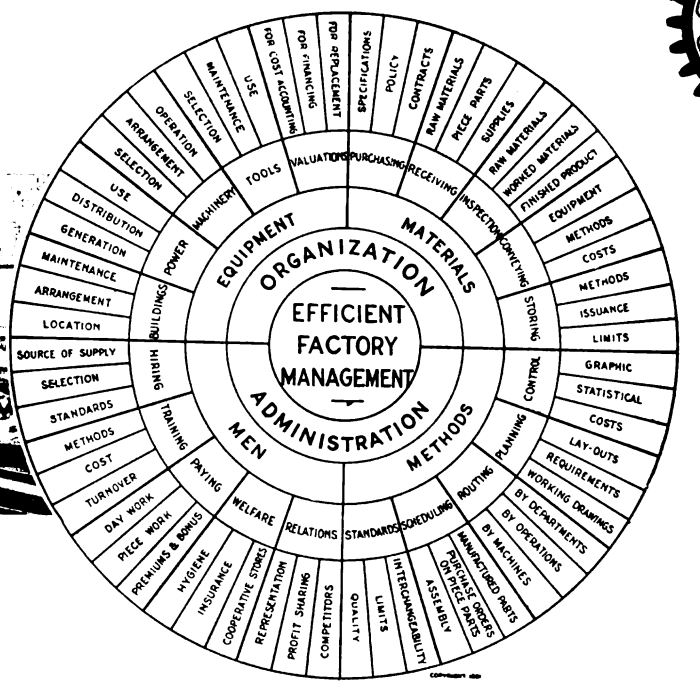
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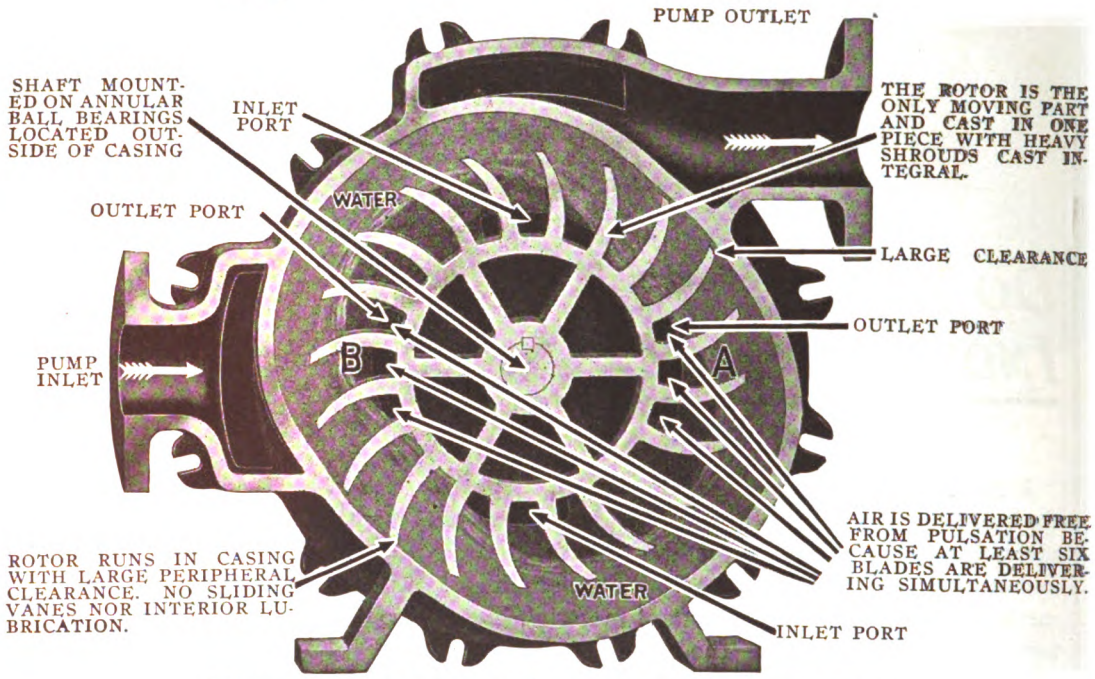
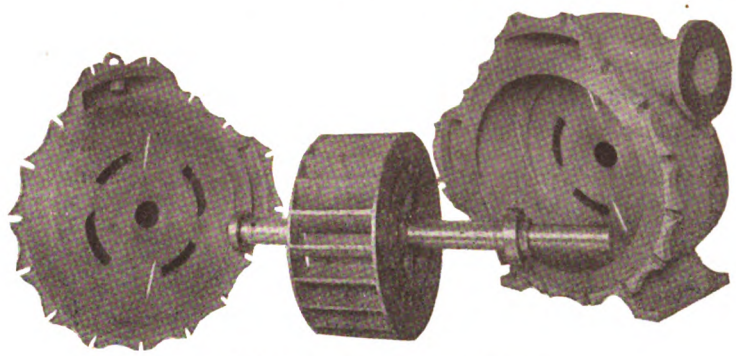


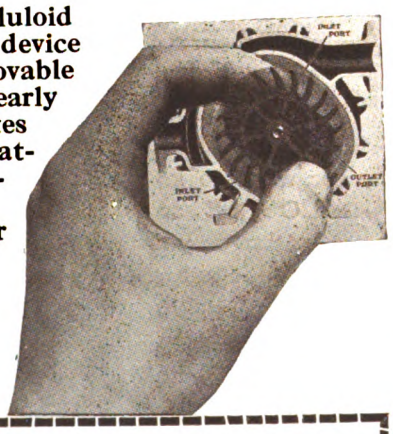
Diagram illustrating unique principle of operation



All the parts of the Hytor

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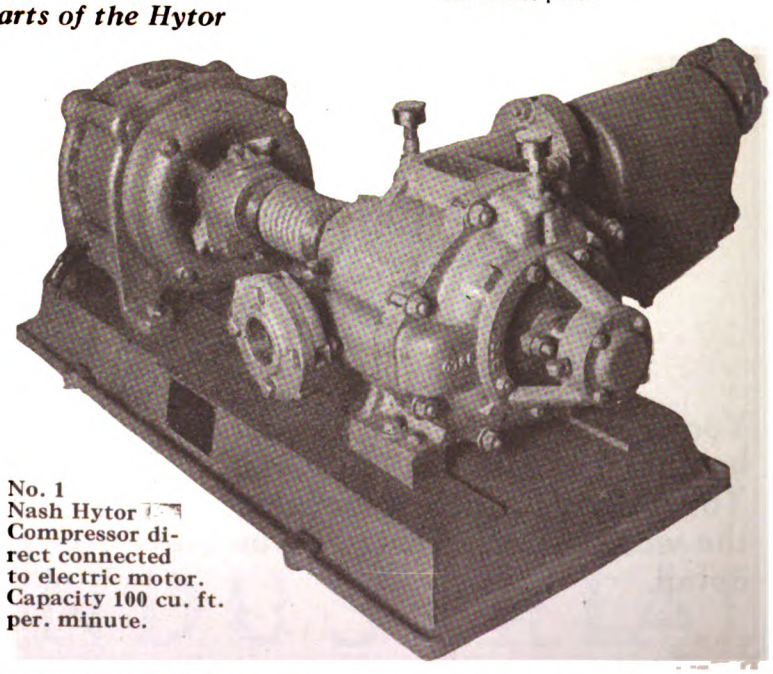
This celluloid graphic device with movable rotor clearly illustrates the operating principle. Send for your copy.



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EDITORIAL

Power—the Key to Progress

LONG ages ago, back in the prehistoric mists, Man, like every other creature of that time, had to contend with enemies both of his own and of other species. There were creatures far more swift, far more powerful than Man: the Dinosaur, the Plesiosaurus, the Mastodon—these had strength beside which man's strength was insignificant. Yet man not only survived, but rose to dominate all the other animals.

Even today, we see animals and insects which, relatively, possess muscular power many times that of Man. The Gorilla, the Kangaroo, the Ant, even (and especially) the lowly Flea, size for size and weight for weight produce from two to twenty times the muscular power of the strongest man.

Little by little, through the centuries, Man by superior intelligence brought the more tractable of the beasts, such as Horses, Oxen, and so on, under his sway; using their strength for his own comfort, convenience and progress.

All the while, right at hand, lay sources of power of undreamed-of magnitude. We are accustomed to think that the discovery of Steam Power dates from the work of James Watt, in the middle of the eighteenth century. The steam turbine did not come into practical use until the latter part of the nineteenth century. Yet Hero of Alexandria, a geometer and writer who died during the first century of the Christian Era, designed a crude but workable steam turbine *almost two thousand years ago.*

On every hand the lesson was plain, that in man's intelligence—not in his muscular power—lay the key to progress; yet for generations and even centuries Man continued to depend upon muscular strength, rather than to rouse himself to the newer and better ways at hand.

We are accustomed to think, too, that we of today are thoroughly awake; that the lethargy or mental laziness or lack of initiative which allowed such ideas as Hero's turbine to remain undeveloped, is a thing of the past.

But, enlightened as we are, we continue to burn as fuel the valuable by-products of bituminous coal; we continue to waste fuel by faulty draft regulation, improper firing, and the like; as an industrial nation, we continue to throw away roughly two-fifths of the potentially obtainable heat value in the fuel we burn.

There was excuse for this twenty, thirty, a hundred years ago. There is no excuse for it today, because American inventive genius and American engineering ability have shown us the way out—have provided machinery to harness power with minimum waste. Some of these engineering achievements are shown in this issue—others, equally important will appear in subsequent issues. From them may be learned the secret of the intelligent mastery of industrial power, and the conservation of the coal pile.

Additional copies of this Editorial will be furnished on request

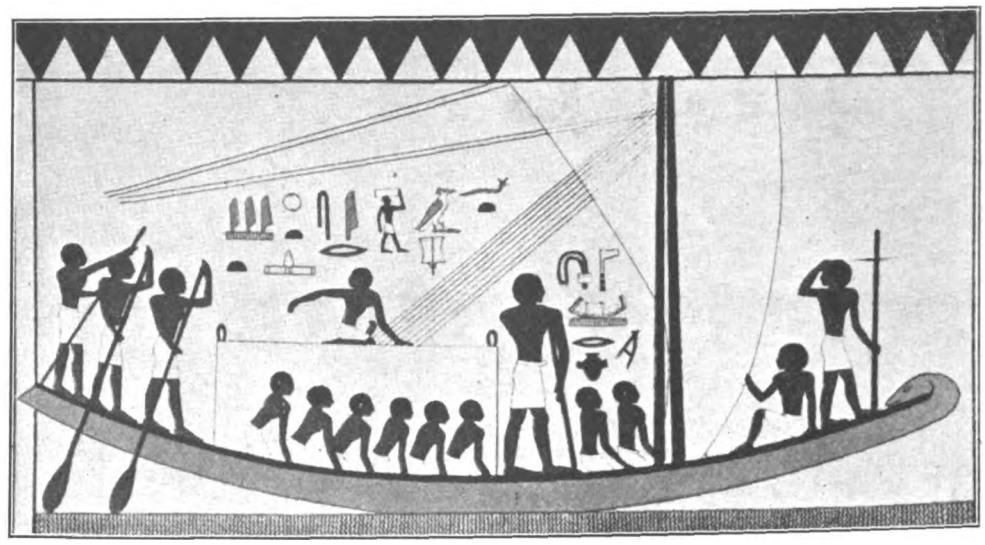
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First Attempts to Use Power

Although the "Age of Power" Is Only 100 Years Old, Even the Steam Turbine Was Forecast Some Two Thousand Years Ago

BY H. H. MANCHESTER

THE development of the use of power has been a tediously long and slow process. Up until the recent past it is doubtful if mankind could be said to have taken one step in a century in this direction. On the other hand, the influence of power has been enormous. The chief characteristics and social conditions of an age have generally been dependent on its method of using power and even comparatively slight changes in this method have produced important results in the civilzation of the time. In fact it might well be claimed that the reason civilization advanced so slowly until less than a century ago, was that the inventions to apply power during the previous ages were so few and far-between.



The Egyptian Sailboat, at the dawn of history, some 5,500 years ago; the first known machine to use power other than muscular strength.

The influence of power on civilization has never been thoroughly investigated, and this is no place to do it, for we can give here only a bird's eye view of the earliest efforts in this field.

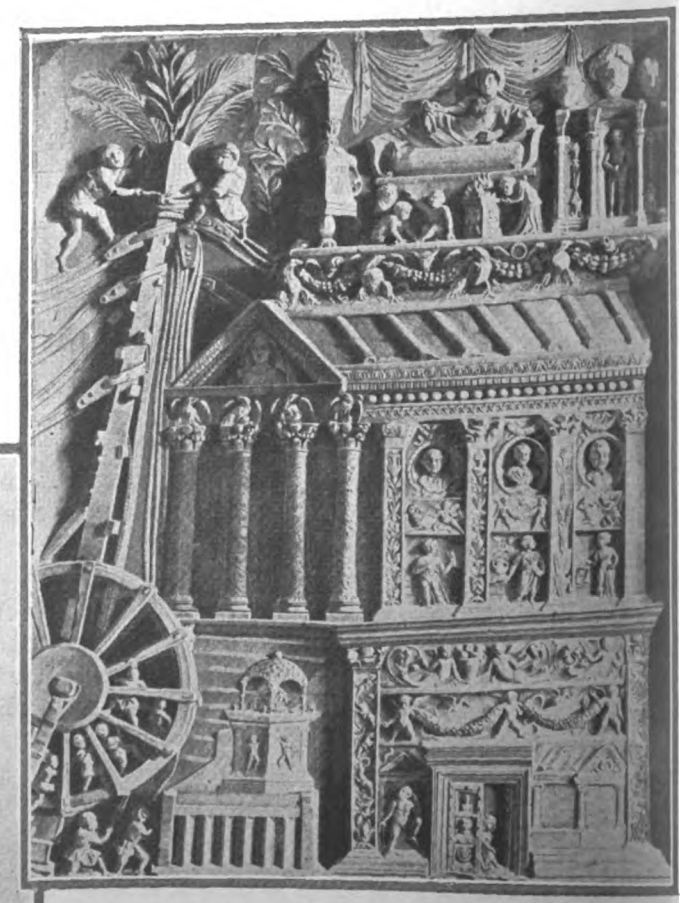
When the dawn of history broke in Egypt in the 4th Dynasty at Memphis, perhaps 5500 years ago, there was only one power outside of muscular strength that was applied through anything that might be called a machine. This was the wind, and the machine was the sailboat. How long this had been in existence before the beginning of the Egyptian pictures in the tombs, we cannot say, but there are rude sketches of boats belonging to the remains from earlier dynasties, and probably the sailboat was known for some time before the representations of it which have come down to us.

Another power which was made use of, though not through a machine, was fire, and of course agriculture, which was already practiced, implies the application of certain natural energies. The chief powers in use were those of man and animals. There were already, however, a few important machines which were employed as converters of muscular strength. While these are somewhat beyond our subject, they are well worth mentioning.



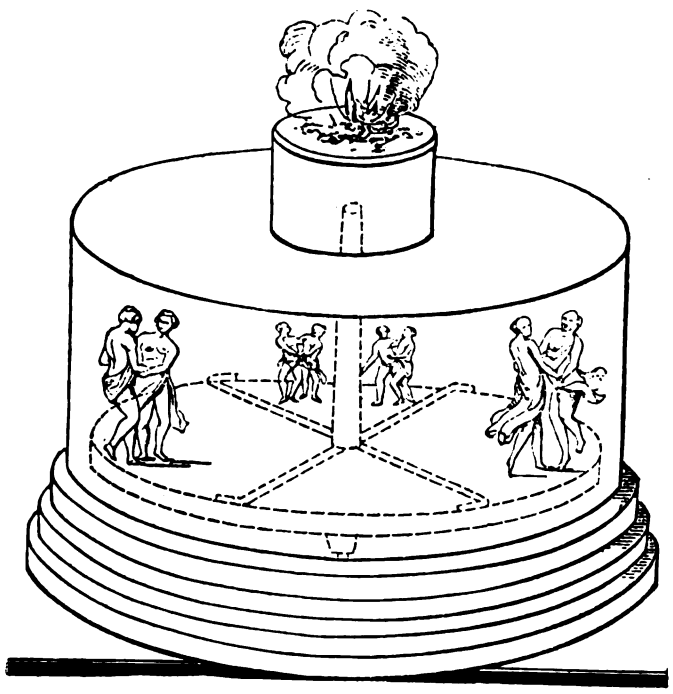
The Egyptian bow-drill, a machine to apply hand-power for rapid circular motion; in use at the dawn of recorded history.

Below—Foot-power applied to bellows, for forced draught (about 1,500 B. C.) —the forerunner of the blast furnace.



The Roman Tread-Wheel Derrick, operated by slave-power, which was much used on their heavy engineering work; a literal and direct "Multiplying of Man-power."

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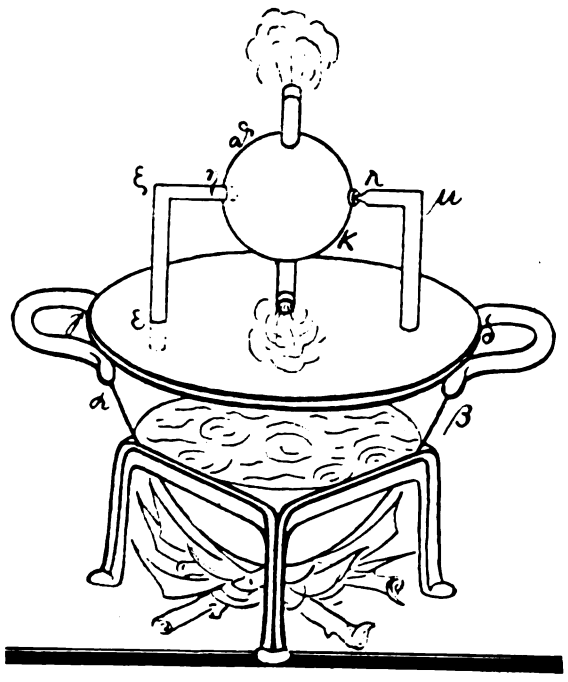


Hero's suggestion for using hot air to turn a table on which are dancing figures. About the beginning of the Christian Era.

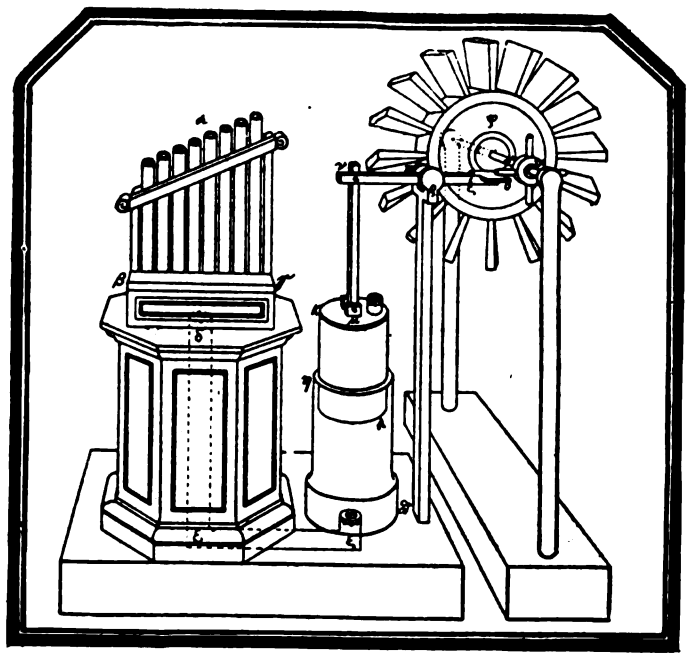
was thrown entirely by hand. An invention that seems to have come in not long before the beginning of history, was the potter's wheel. Moreover, pottery itself does not go back much before the New Stone Age.

For transportation the Egyptians employed not only sail boats and row boats, but wheeled carts. The wheel was a great aid in the application of animal power, and was one of the epochal inventions of prehistoric times.

Curiously enough, in moving huge stones, the Egyptian tomb paintings illustrate, not the employment of wheels or rollers, but of a drag. The hauling of this was made easier by oiling the road. In building great works such as the pyramids, the road was gradually raised until it became an inclined plane, up the oiled surface of which the rocks were dragged by muscular strength.



Hero's drawing for a steam turbine. Had this been carried to practical development, it is interesting to speculate on the changed history of these 2,000 years!



Hero's design for a windmill to supply an organ with compressed air. Where were the "practical business men" of two thousand years ago?

In agriculture the most remarkable was the shadoof. This consisted of a long horizontal pole suspended to a post, somewhat like the well sweep still to be found in country districts. This was used to raise water from one level to another, and, in fact, was what made possible the irrigation of a large part of the Nile valley. The simple tools of the agriculture of the time need not be considered.

In wood and stone work, the most interesting machine was the bow drill. The bow had existed for ages previously, but the winding of the bow string around the drill made possible important new operations, and was an invention of great value.

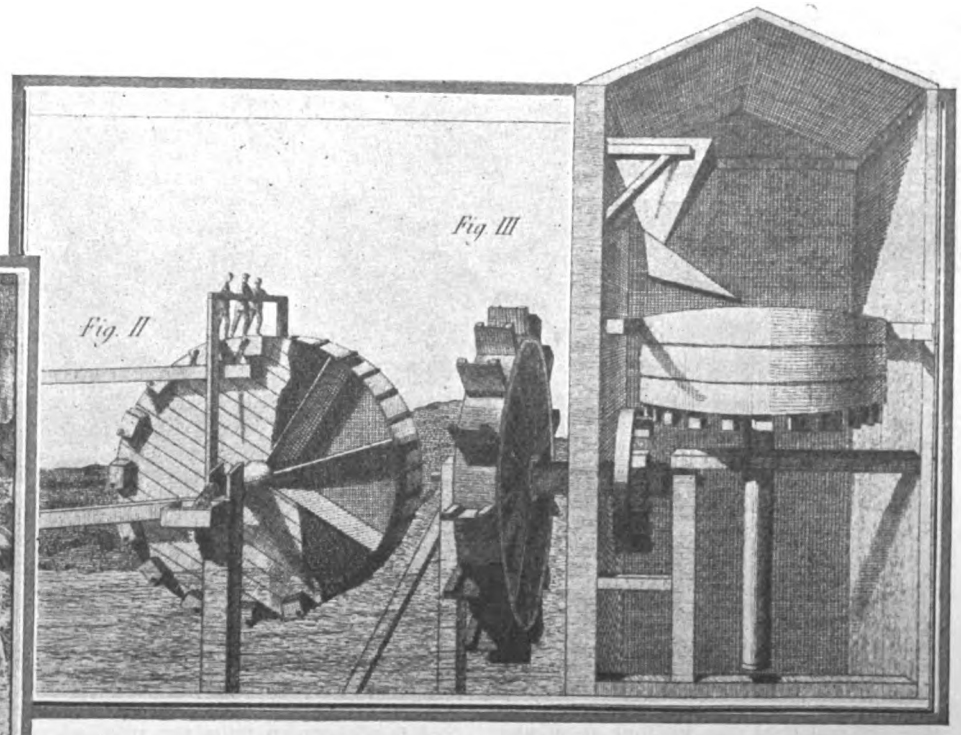
In textiles a rude loom was already in use, but the shuttle

Foot power is illustrated in pictures from the Theban Empire about 1500 B. C. This was the goat skin bellows, which was used to blow the fire for smelting and foundry work. A man stood upon two bellows at a time, driving the air through a

(Continued on Page 32)



At the left—The Roman Ass-and Slave-Power mill, for grinding grain. Water mills did not appear until just before the reign of Augustus.

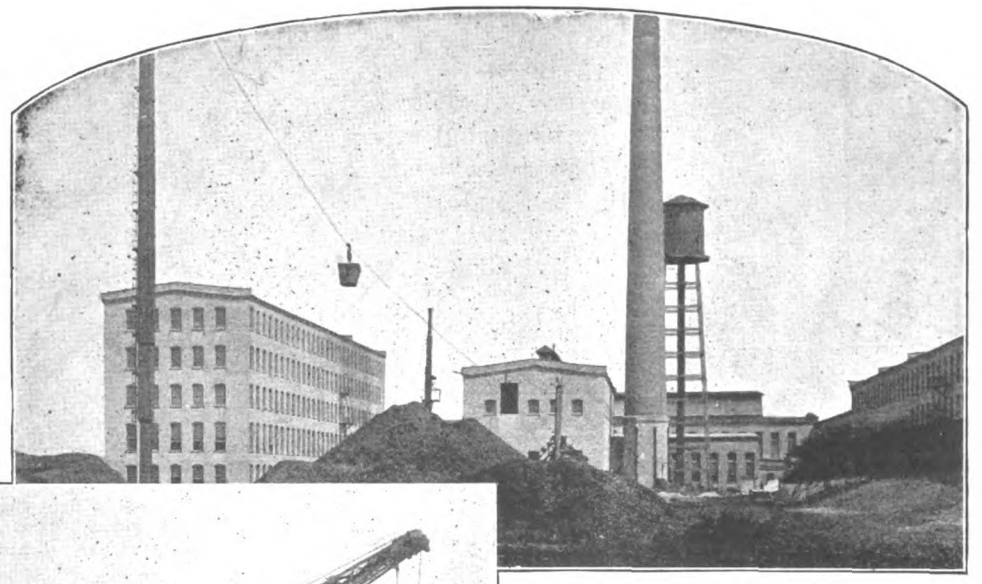


A Roman Tread-Wheel for raising water, and on the right, a water-Wheel employed for grinding grain.

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Power Plant

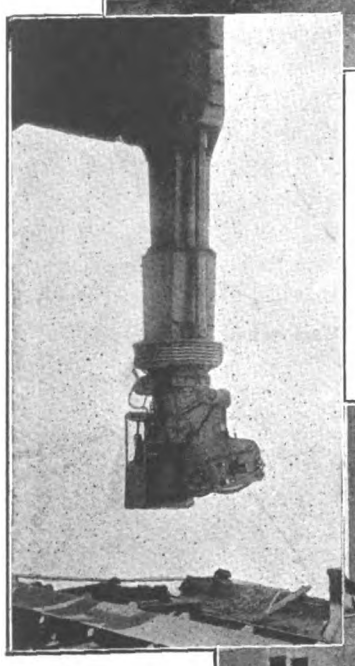
How Modern Machinery





The industrial plant coal pile represents the starting point of the power generating cycle. Due to present-day engineering accomplishments, distance from coal pile to power plant makes little difference. In the above installation a bucket traveling on a cable between two steel or wooden masts enables the reserve supply to be handled, stored and reclaimed mechanically at low cost.

(Godfrey Conveyor Co., Elkhart, Ind.)

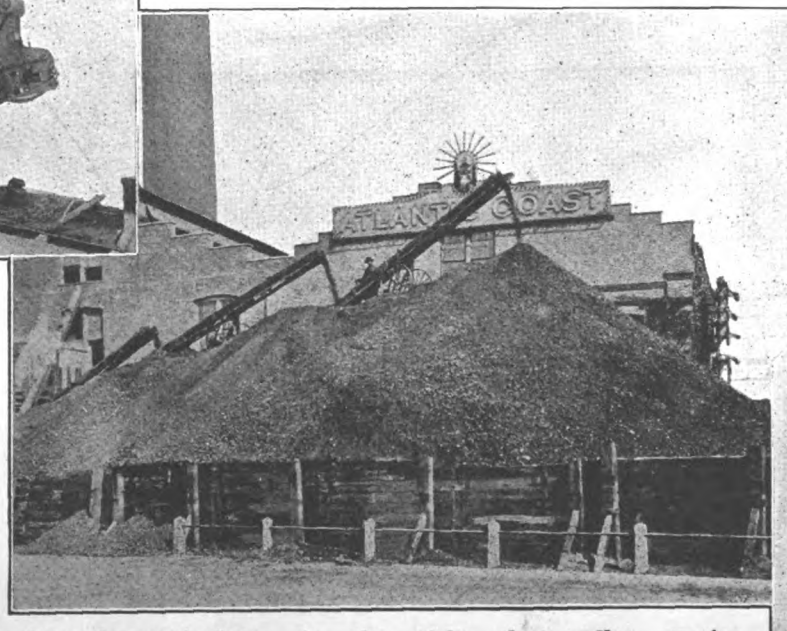


Where coal is received by water shipment on barges, the consumer gets the advantage of a low freight rate. At the left is a huge electrically operated coal trimmer, transferring the fuel supply from barge to conveyor belt.

(General Electric Co., Schenectady, N. Y.)

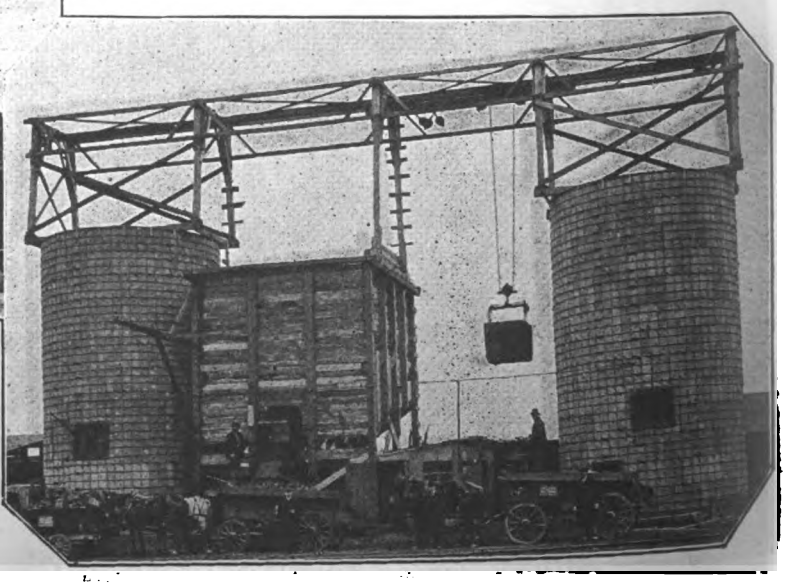
At the plant of the Elgin Watch Co., the coal pile is located alongside of the railway spur adjacent to the power house. A locomotive crane with a grab bucket of 54 cubic feet capacity transfers the fuel supply as needed from coal pile to bunkers.

(The Brown Hoisting Machinery Co., Cleveland, Ohio.)



Thirty men were formerly required to unload and store coal for this power plant. By means of these portable scoop conveyors 350 tons a day are stored on this 300-ton coal pile by four men, and taken into the plant as required.

(Portable Machinery Co., Passaic, N. J.)



At the right the trolley carrier, which is operated by one man, is handling coal from railroad cars to overhead bins at a cost of 11½ cents a ton. The coal is withdrawn from the railroad car on the siding through a shallow hopper to the bucket which is operated by an electrical hoist. From the bin trucks are loaded by means of a chute.

(Conveyors Corp. of America, Chicago, Ill.)

THOSE of us who can go back twenty or thirty years in our recollection of power plant methods, will remember the time when transportation was not what might be called a vital problem. It was a case of dollar-a-day labor then, and the mechanical equipment used in conveying coal and ashes consisted mainly of wheelbarrows and shovels. Today what a difference! As you glance over these pictures and read the captions which tell tell about the work that machinery is doing to aid, or rather to perform almost entirely, the task of moving coal and ashes in a modern boiler plant, just think of the fact that twenty years ago hardly any of these mechanical improvements were known or utilized. Coal from the mines or reshipped from the dealer's storage piles arrived in carloads. A gang of husky laborers, Irish or Hungarian or Italian, according to the locality, attacked this newly arrived coal with shovels and wheelbarrows, wheeling it by the barrowful over extemporized one-plank bridges to the plant storage pile. Frequently the coal, high in sulphur contents, and under certain conditions of self-heating, would catch on fire; in which case the same gang of husky laborers would reshovel it, getting down at last to the smouldering coals and extinguishing them. When it came time to replenish the boiler fire-door coal pile, this same human transportation machinery plus perhaps a half-

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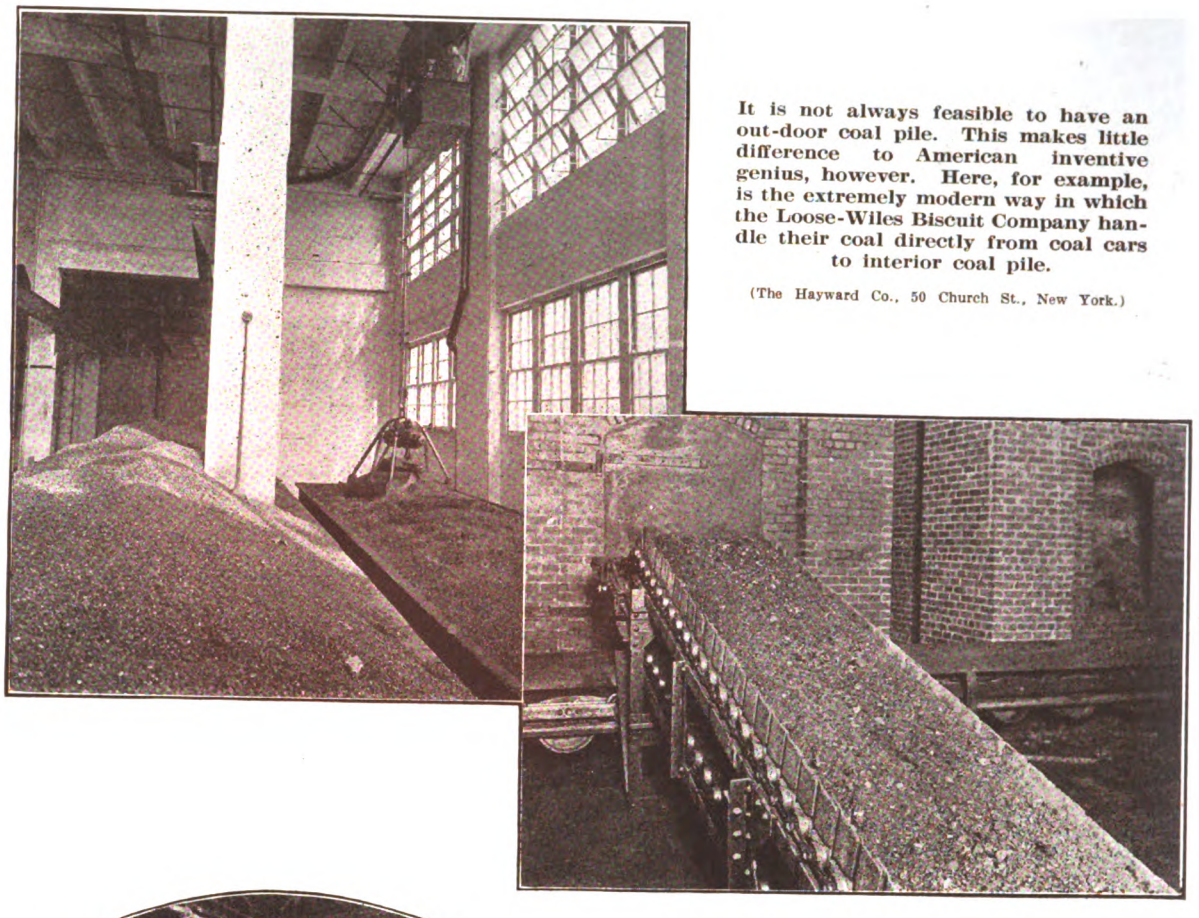
Transportation
Handles the Coal and Ashes

ton or one-ton hand-propelled coal truck would be utilized. Dumped upon the boiler room floor within easy reach of the firemen, this coal was ready to be shoveled by hand into the furnaces.

The criterion by which to judge a good fireman in those days was his steam gage. Engineers and managers in any except possibly the very largest and most progressive plants would have laughed at the thought of taking the time and trouble to weigh coal and measure water.

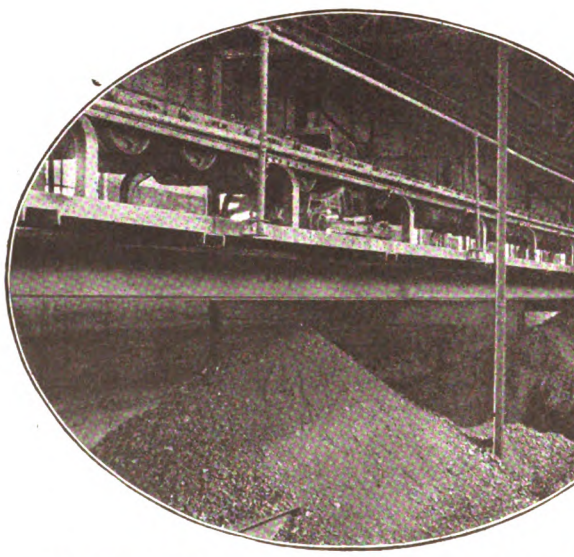
After this final hand shoveling of the coal, there still remained in the old-fashioned power plant another hand shoveling or series of hand shovelings perhaps in connection with the ashes and clinkers. Very often it was a case of two or three transfers: first from the fire pit into wheelbarrows or buckets, next into carts, and finally from the cart to the cinder pile, where level land was being made out of swamps or unusable hollows.

The contrast between the methods just depicted in words, and the modern methods depicted here in pictures, forms a most striking object lesson in the rate at which Americans are going forward in power plant engineering. Today, from start to finish in a modernly equipped plant, the human element is the least conspicuous. The coal, arriving at the plant in dump cars, is deposited by gravity directly upon the storage pile. Conveyors carry it



It is not always feasible to have an out-door coal pile. This makes little difference to American inventive genius, however. Here, for example, is the extremely modern way in which the Loose-Wiles Biscuit Company handle their coal directly from coal cars to interior coal pile.

(The Hayward Co., 50 Church St., New York.)

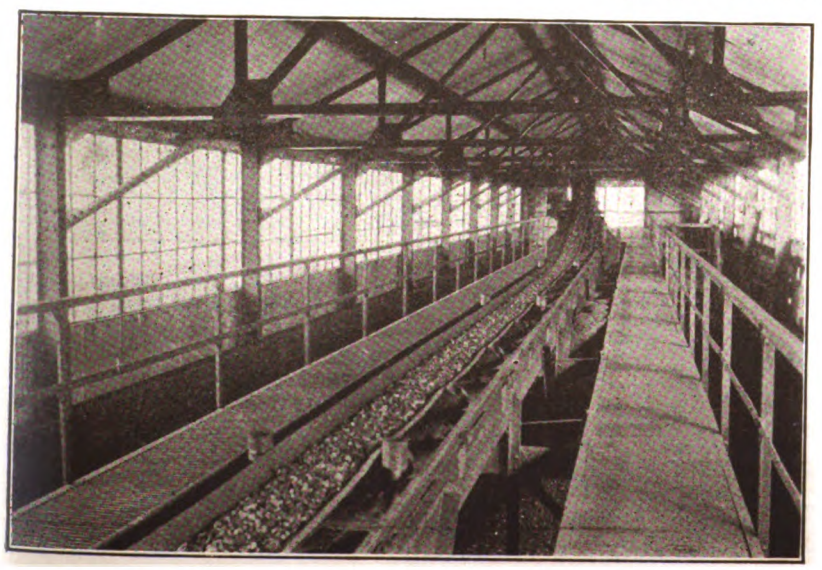


In the old days of hand labor coal moved intermittently so to speak in shovelsful and wheelbarrowsful. Now it flows in steady streams, thanks to the perfection of conveyor systems. Here is a stream of coal being delivered from one conveyor to another at right angles to it.

(The Jeffrey Manufacturing Co., Columbus, Ohio.)

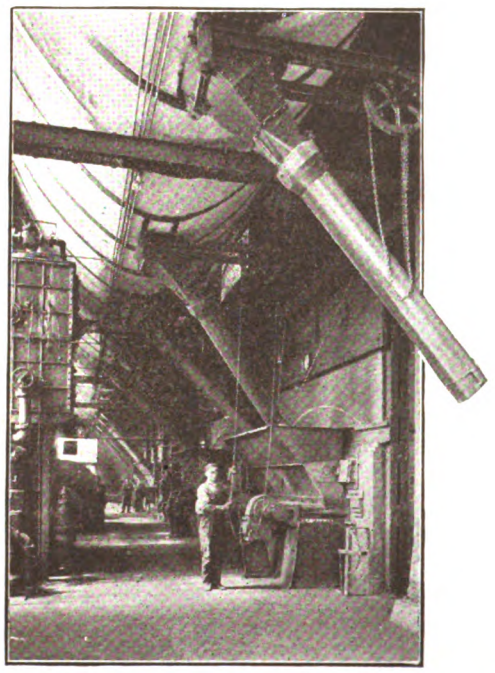
In a modern power plant, such as that of the Solar Refining Co., shown above, when it is desired to fill a certain coal bunker it is merely necessary to set the tripper at a certain point after which the conveyor buckets will dump automatically.

(The Jeffrey Manufacturing Co., Columbus, Ohio



Coal flows through a modern plant like a brook through a meadow. Look at this stream of potential power on its way to the bunkers of the Whitaker-Glessner Co., of Wheeling. The installation shows a belt conveyor.

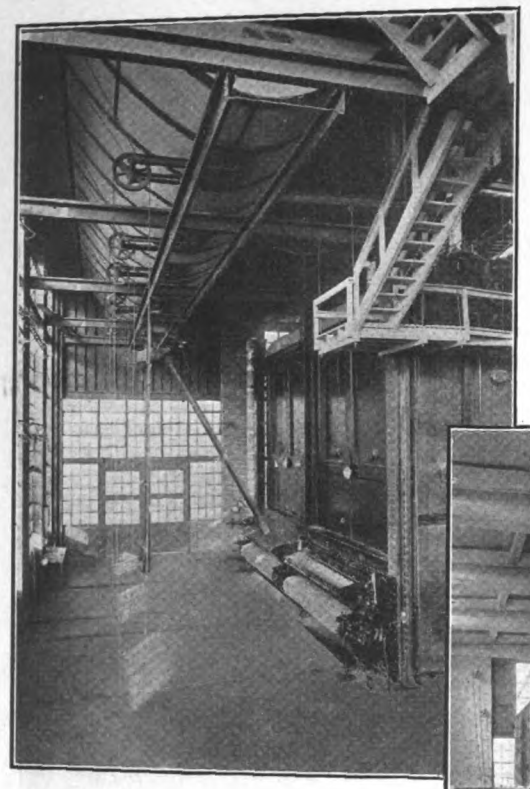
(The Webster Manufacturing Co., Chicago, Ill.)



The key-note in modern power plant coal handling is altitude. Get the coal up high to start with and then let gravity do the work of feeding it to the stokers. Note the enormous reinforced concrete bunker overhead in this picture. It is kept full by an overhead conveyor. The installation is at the Transue Williams Co., Alliance, Ohio.

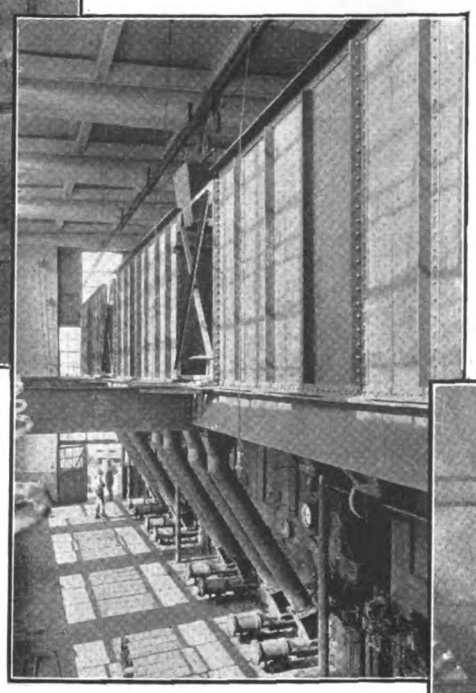
(The Jeffrey Manufacturing Co., Columbus, Ohio.)

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The Nordyke & Marmon Co. believe in light and cleanliness in their boiler room as well as in modern engineering equipment. The delivery chute from the bunker travels along on the overhead trolley from one boiler to another, and the delivery of coal to the stokers is regulated by chain-operated hopper gates.

(The Brown Hoisting Machinery Co., Cleveland, Ohio.)



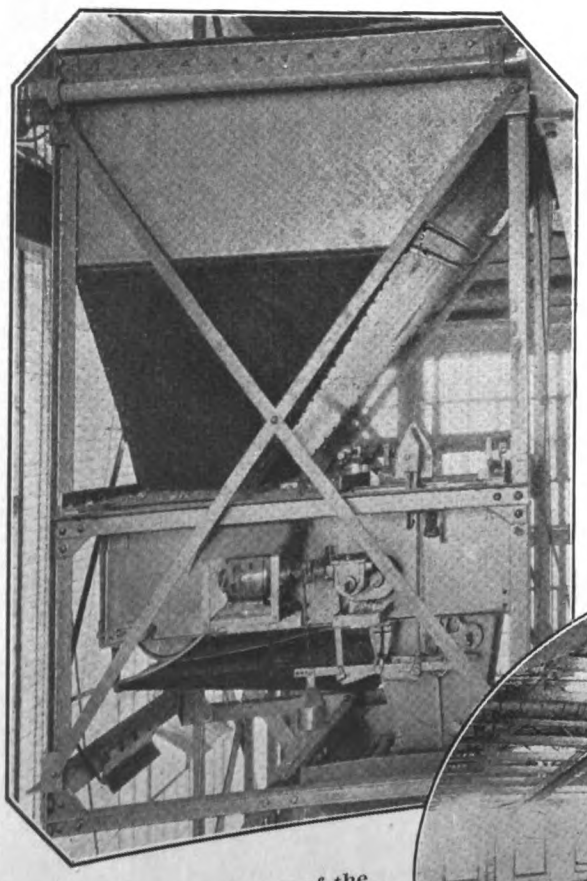
This is the interior of the Van Camp boiler room. An I-beam track extends over the steel plate bunkers. A one-ton bucket travels along this track and empties into the bunkers which feed the coal by gravity into the automatic stokers. Coal is thus taken from car to fire box without hand shoveling and by the service of only one man.

(Godfrey Conveyor Co., Elkhart, Ind.)



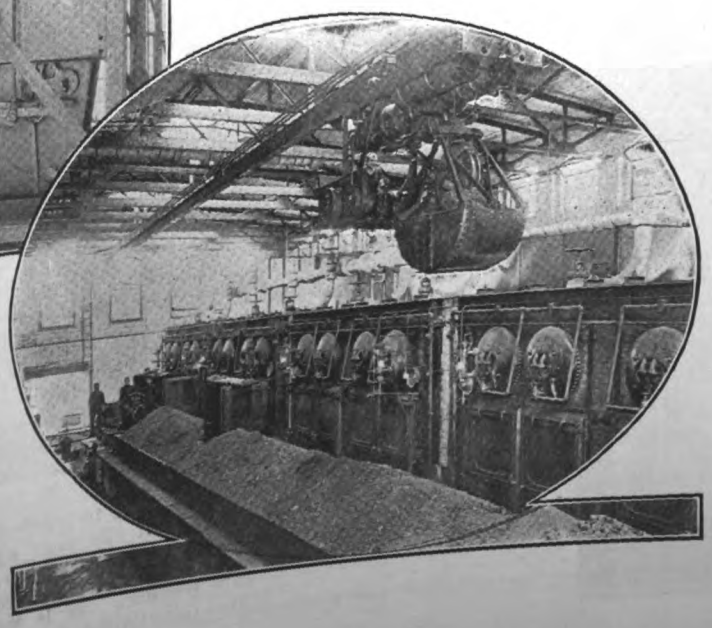
Here is a traveling weigh hopper in the plant of the Whitaker-Glessner Co., of Wheeling, W. Va. It moves on the overhead trolley tracks from one stoker to another delivering coal as required from the overhead bunkers.

(The Webster Manufacturing Co., Chicago, Ill.)



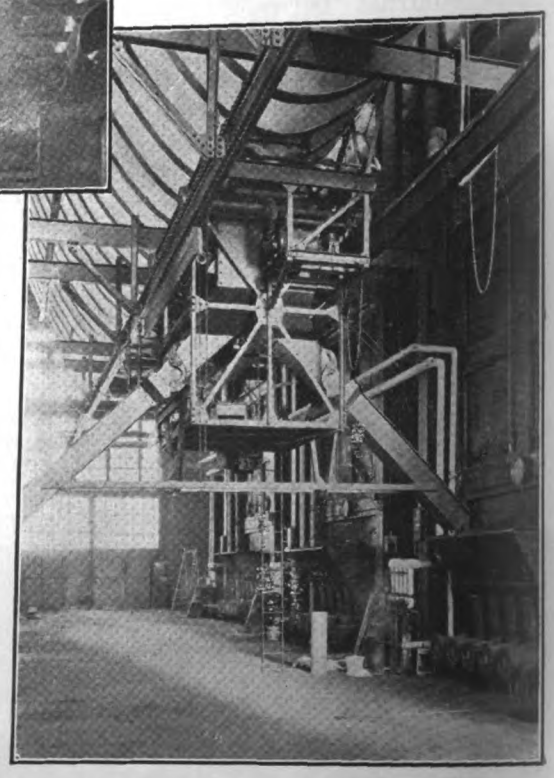
Here you can see the top of the hopper and the chute leading from the overhead bunker, on the Automatic coal scale shown at the centre of the opposite page.

(Richardson Scale Co., Passaic, N. J.)



Modern machinery can always find a way to lighten the task at the Municipal Lighting Co.'s plant at Holyoke, Mass. Coal is effectively economically delivered to the boiler room by means of the clam-shell bucket and overhead trolley hoist.

(The Hayward Co., 50 Church St., New York.)



Results count in the boiler room as much as anywhere else in the plant. If we expect to get results we must know what they are. We must know first of all exactly how much coal is fired in each furnace. Modern inventive genius has met this requirement with the production of an automatic coal weighing device, which weighs and registers the amount delivered to each furnace. The installation shown is at the Utica State Hospital, N. Y.

(C. W. Hunt Co., West New Brighton, New York.)

thence to the overhead bunkers, great reinforced concrete or steel plate bins located at the top of the boiler plant. The coal is thus given a "head" similar to the head of water in an elevated reservoir. From this point on gravity and steam or electric power take care of the transportation. Traveling "down-spouts" connect from the overhead bunkers to the individual boilers, delivering supplies of coal as needed into the hoppers of the mechanical stokers (these by the way are among the outstanding achievements in boiler plant engineering progress and will be shown pictorially in a later issue).

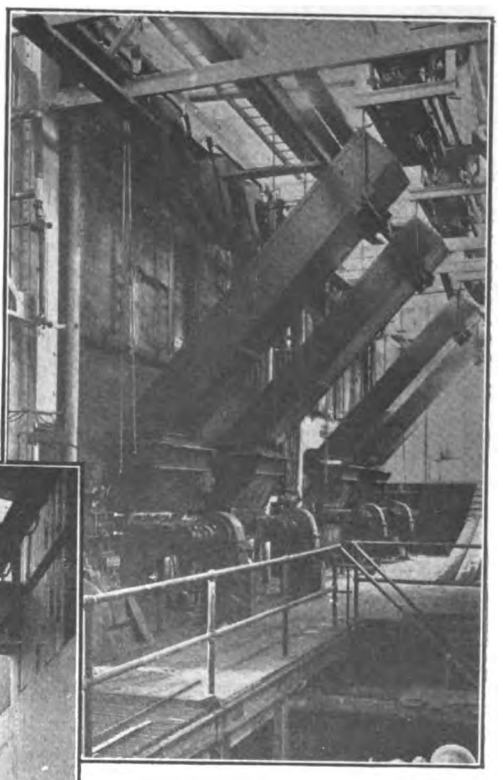
The high price of present day coal plus our national realization that we have but a limited supply, dictates the most rigid economy in its use. Thus, instead of the old haphazard firing with its wasteful results, everything going into the boiler—and coming out of it too, one might almost say—is weighed and measured just as a chemist weighs the ingredients of a mixture. Coal weighing is done automatically as the coal passes from the bunker to the stoker. The weight of coal burned during a given time, when compared with the

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record of feed water, which corresponds to the boiler output in pounds of steam, for a similar period, gives the plant engineer an accurate check upon the efficiency with which his coal is being burned.

Today, even the disposal of ashes is a mechanical job instead of a laborer's. The way in which this is done in the modern plant depends largely upon the conditions encountered. Perhaps it may be by the steam jet method, in which case the fireman removes a hand-hole cover from an opening in the boiler room floor, shoveling or hoeing the ashes into this opening, whence they are carried away by a jet of steam and deposited in an ash storage tank on an ash pile, or even carried into an adjoining vacant field and deposited directly upon the dump. Perhaps again it may be through the agency of a mechanical conveyor, or skip hoist, that these ashes are taken away from the ash pit and delivered to overhead bunkers, from which in turn they are dumped by gravity, as required, into railroad cars or trucks.

Twenty years ago our boiler plant consisted of a boiler with its feed water pump and usual accessories, principal among which was its steam gage. Today the boiler is, so to speak, almost a secondary part of the

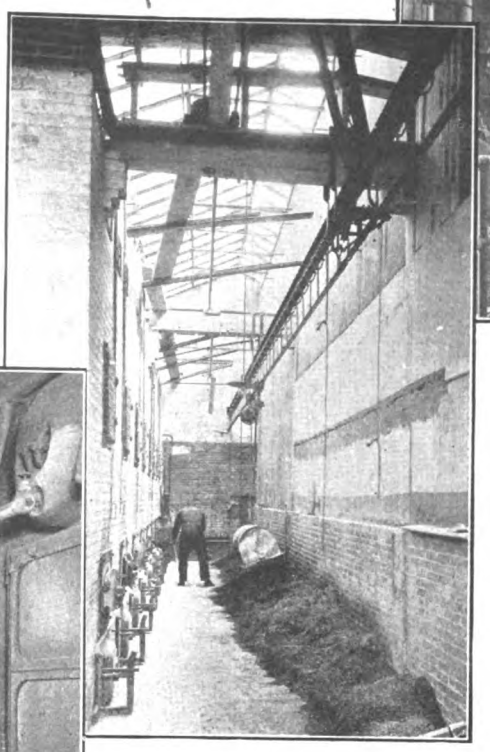


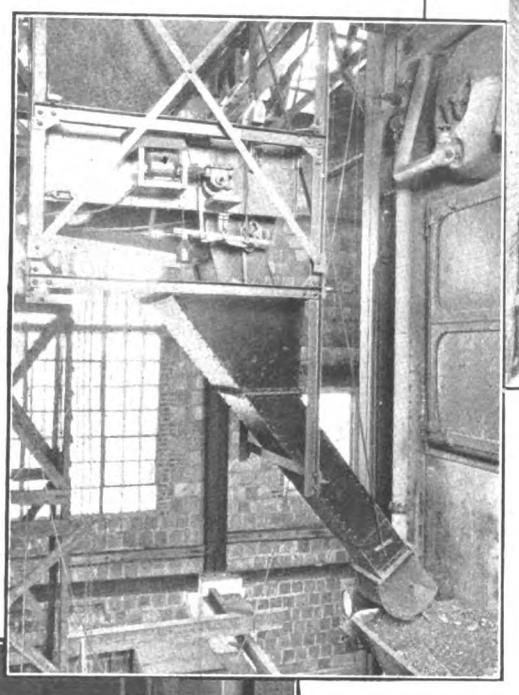
An installation of four automatic coal scales in a modern industrial plant. Accurate records of hourly consumption per boiler are made available for determining combustion efficiency.

(Richardson Scale Co., Passaic, N. J.)

The picture below shows an automatic coal scale installed in the boiler room of a modern textile plant. An absolute check on the amount of coal burned in twenty-four hours is registered by the scale. Note that the machine is fed by an overhead bunker and that it weighs and registers the coal as it is delivered through the downspout to the stoker.

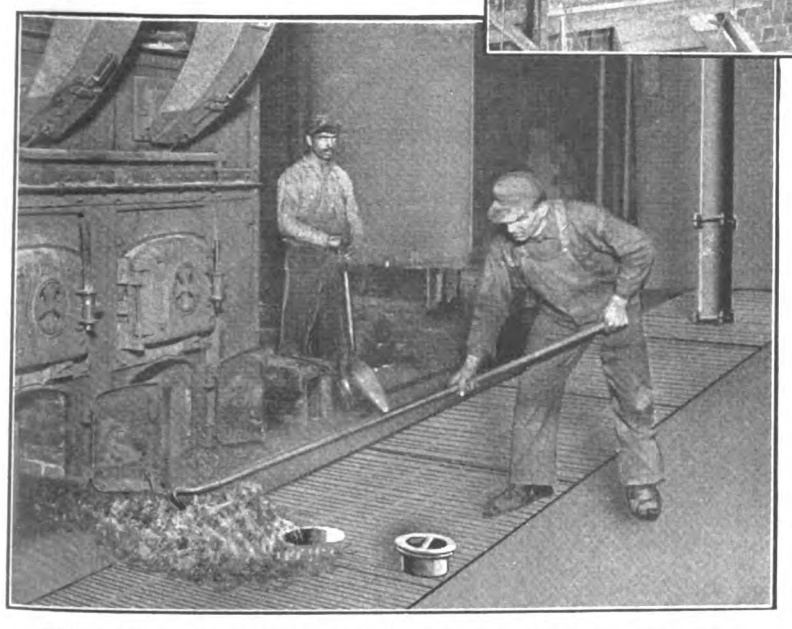
(Richardson Scale Co., Passaic, N. J.)





Where it is not feasible to feed from overhead bunkers, as is the case in many existing installations, the overhead trolley is a decided step toward getting the most out of the plant. Here are the hand-fired boilers of the Williams Baking Co., Scranon. Coal is delivered convenient to the fire doors by means of this dumping bucket and traveling hoist.

(The Louden Machinery Co., Fairfield, Iowa.)



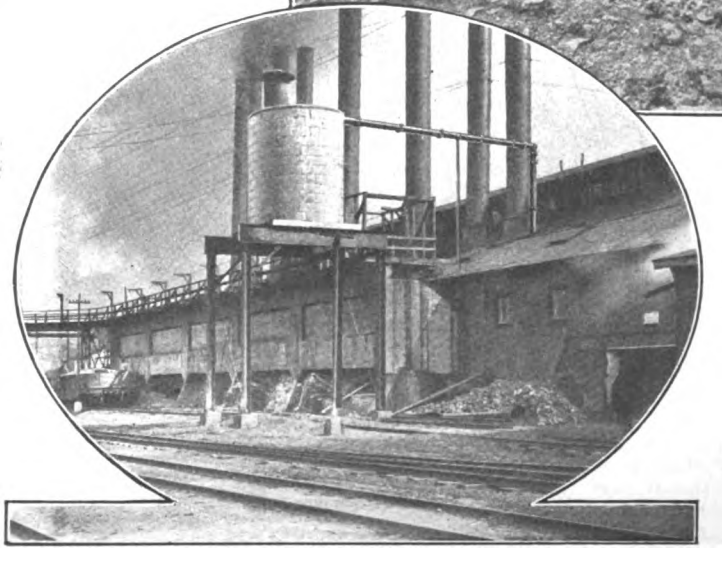
Coal handling is only a part of the problem of power plant transportation. Wherever coal is burned ashes must be handled. In the modern plant this is not done by hand. Here, for example, is the first step of the steam jet conveyor system of ash disposal. The fireman shovels the ashes into intakes in the floor. Then the ashes are blown by steam to storage tanks or any desired place of disposal.

(United Conveyor Corp., Chicago, Ill.)



Where it is desired to fill in adjacent waste land, the steam jet system will place the ashes anywhere that the pipes are led.

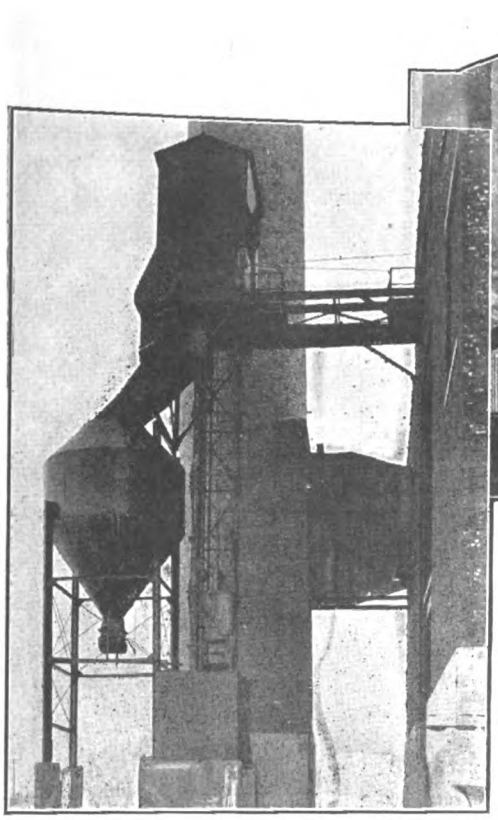
(United Conveyor Corp., Chicago, Ill.)



Sometimes the storage tanks for ashes are elevated over railroad tracks, as shown in this illustration. Thus their contents may be easily emptied as required.

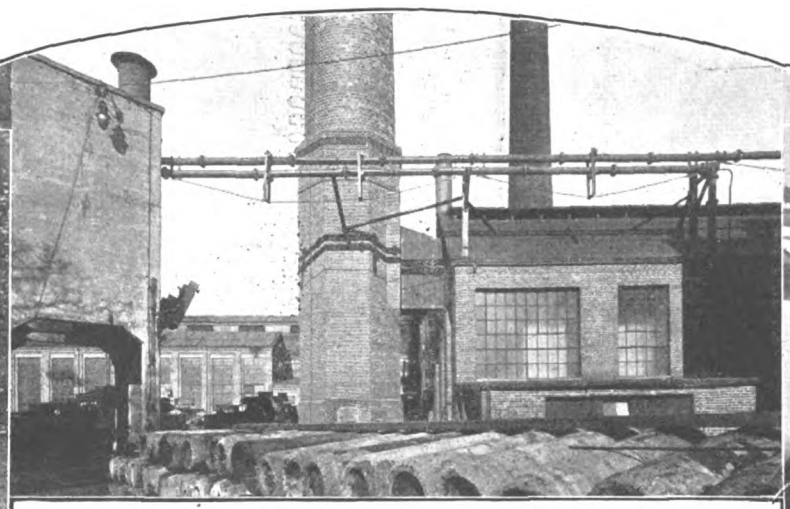
(United Conveyor Corp., Chicago, Ill.)

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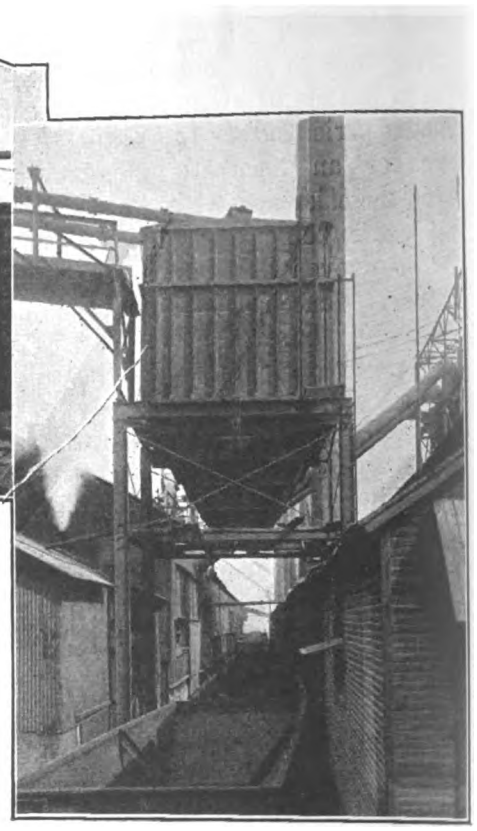
There is seldom any one best way of solving all problems—there is always one best way of solving a particular problem. In case of the ash disposal at the Utica State Hospital, N. Y., the method shown above of handling the ashes to a storage tank by means of a skip hoist was the solution.

(C. W. Hunt Co., Inc., West New Brighton, New York.)



At the modern power plant of the Watertown Arsenal, Uncle Sam uses the steam jet method of handling his ashes. Note the concrete ash storage tank, designed so that trucks may run under it to be filled.

(Conveyors Corp. of America, Chicago, Ill.)

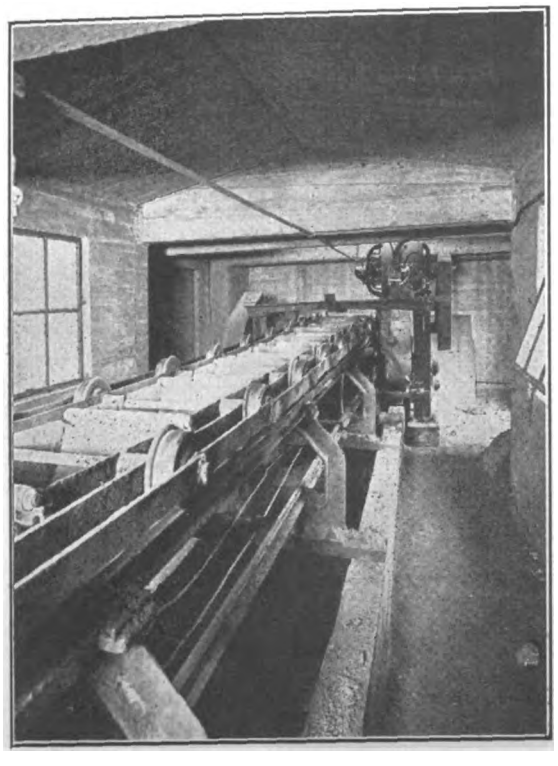


Here is a cast-iron ash hopper built over a railway siding at the Sharon Steel Hoop Co.'s plant, Sharon, Pa. Such plants as these have reduced their ash handling problem to a minimum from the labor standpoint.

(Green Engineering Co., East Chicago, Ind.)

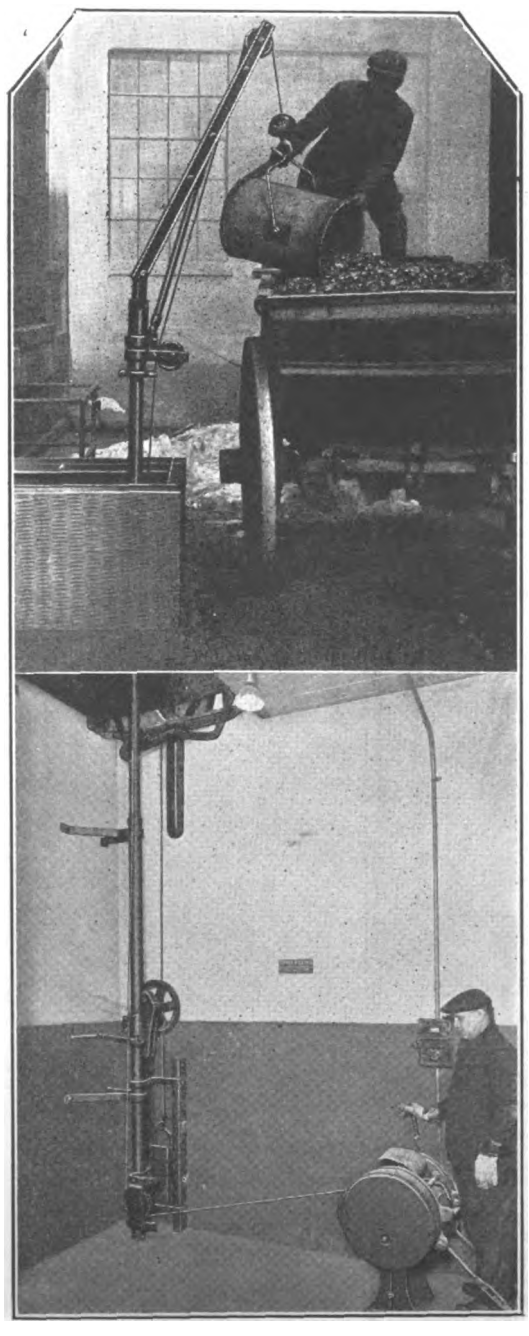
equipment. One is tempted to ask, if he has not studied the question thoroughly, whether or not engineering practice has been a bit overdone. The answer is a simple one. Twenty or thirty years ago boilers were undergoing evolution. One must start of course in the power plant with the boiler. Engineering skill and inventive genius was directed toward improving the fundamental power plant unit, but as time went on the opportunities for such improvement became fewer. Boiler efficiency, in other words, began to reach a point where further investment in improvements did not promise

(*Continued on Page 34*)

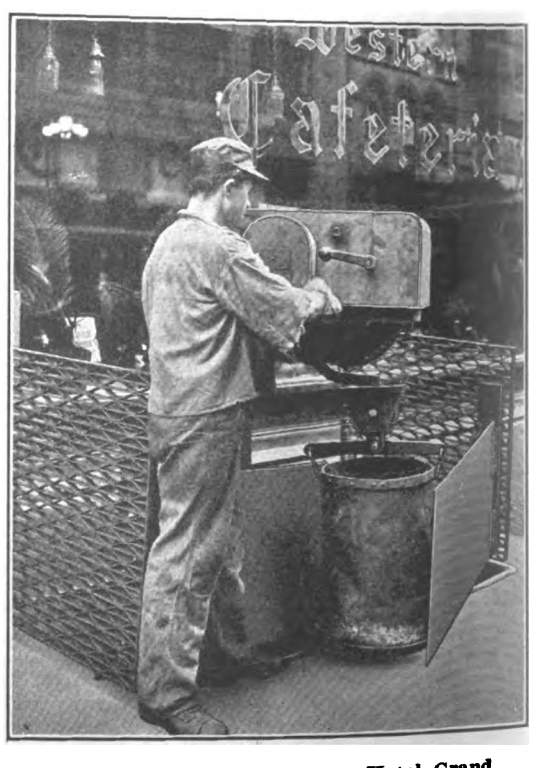


Ashes as well as coal are economically handled by means of bucket carriers. Here is part of the installation in the power house of the Robert Gair Co. of Brooklyn. Bucket carriers bring in coal, distribute it to overhead bunkers and take out the ashes, delivering them to wagons or cars for removal.

(The Webster Manufacturing Co., Chicago, Ill.)



There are great numbers of small and medium-sized power plants, particularly in cities and towns where the subject of ash disposal is a critical and costly one. There may not be room for ash bunkers nor an extensive ash disposal installation but there is always room for a simple and efficient device such as is shown above and at the right.



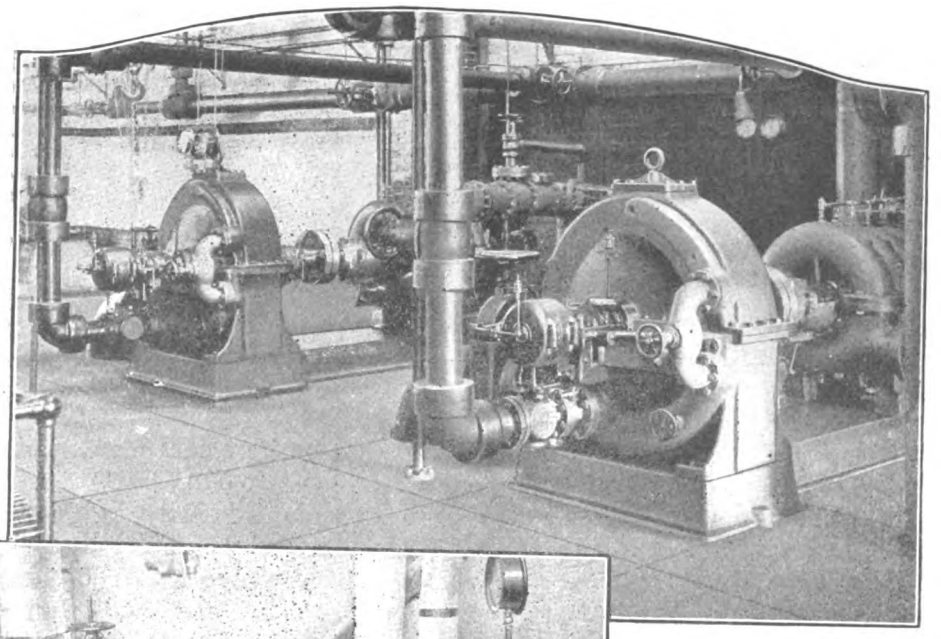
This installation is at the Hotel Grand, New York. It raises ash cans 21ft. 10in. from boiler floor to grade level electrically at a cost of 21 cans for one cent. After this hoist had been in use four years it raised 3500 cans of ashes in one continuous operation after an accumulation caused by snow storm.

(Gillis & Geoghegan, 537 West Broadway, New York.)

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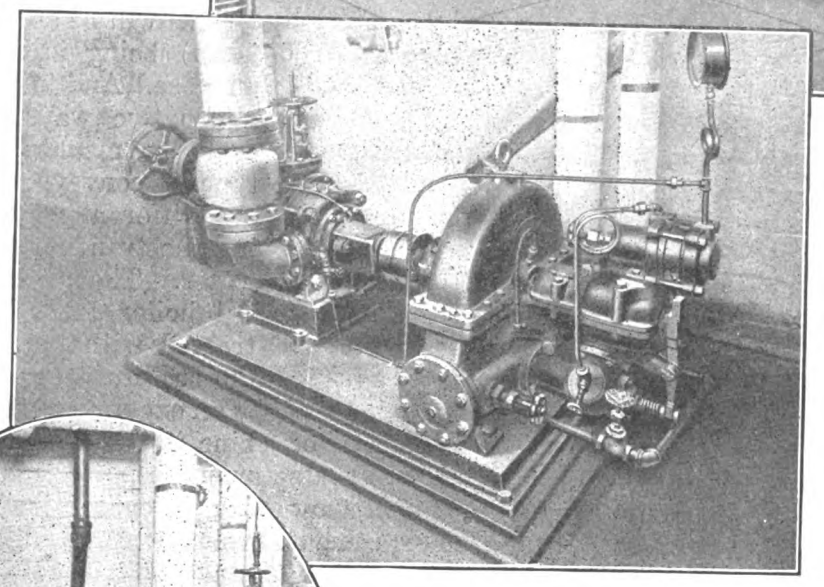
Inside the Boiler Room

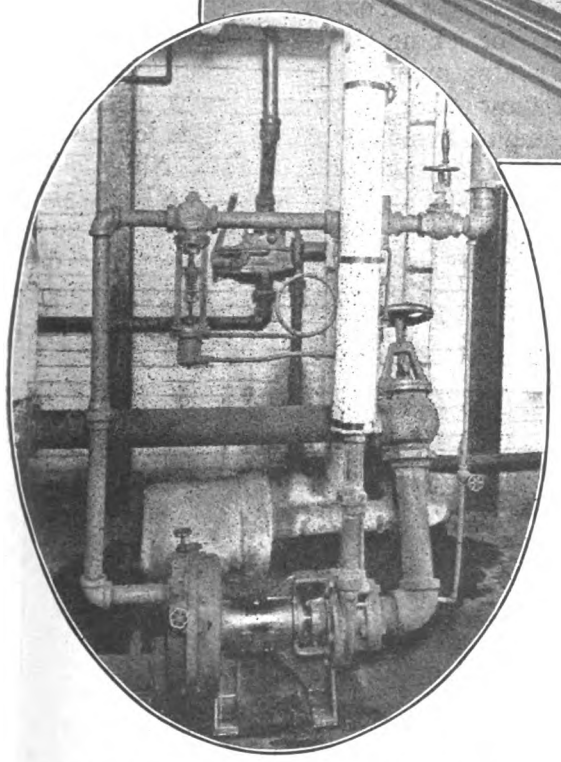
Modern Boiler Feeding and Pressure Regulation



There was a time not long ago when boiler feeding was restricted to reciprocating steam pumps. The development of steam turbines and multi-stage centrifugal pumps has enabled these compact sets to take up this work very efficiently. Here is a boiler feed unit in-talled at the Boston Elevated Railway Co.

(Terry Steam Turbine Co., Hartford, Conn.)





Above is a boiler feed unit a capacity of 150 gallons per minute against boiler pressure of 150 pounds. It is fitted with a follow-up governor which automatically maintains a constant predetermined pressure.

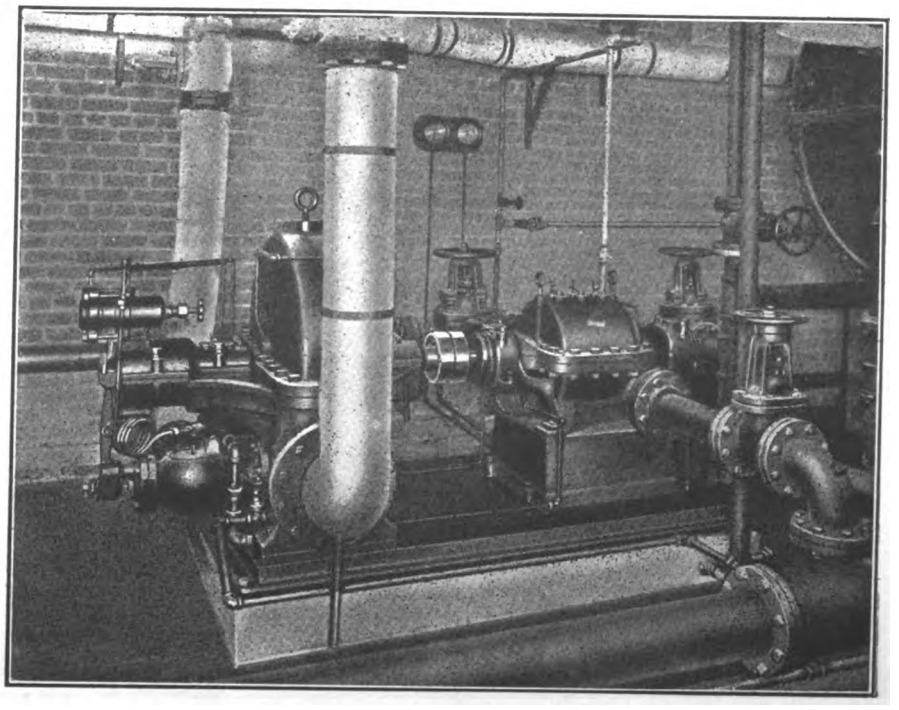
(The Goulds Mfg. Co., Seneca Falls, N. Y.)

This shows a compact unit centrifugal turbo boiler feed pump, installed at the Worcester State Hospital, Worcester, Mass. There are seven 150-horsepower boilers in operation, and one of these little outfits takes care of all of them.

(Coppus Engineering & Equipment Co., Worcester, Mass.)

COAL, air and water are the three principal factors of steam power. We have seen how modern engineering genius has reduced the subject of coal handling to a mechanical science. It has not been less progressive in its dealings with air and water or with its handling and regulation of the steam after combustion takes place.

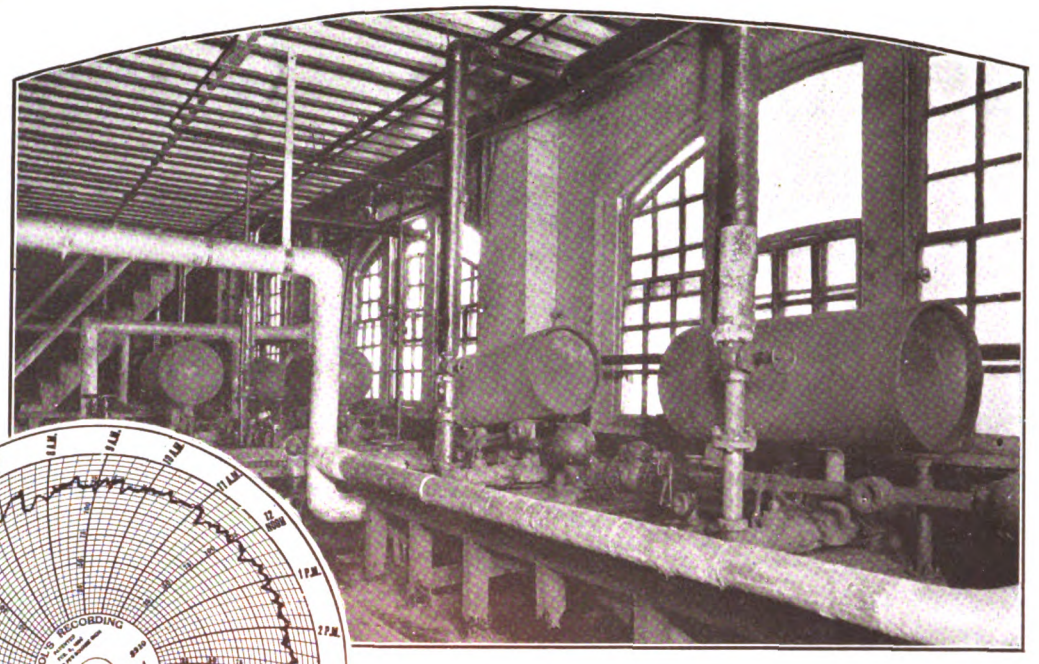
In arranging a series of pictorial articles which will properly depict the modern power plant, it has been difficult to classify and subdivide the various functions that one encounters so that they may be presented in a logical, coherent order. After coal handling for example, which has been treated in our leading article preceding, the logical step is to deal with combustion in the boiler, which includes the subject of mechanical stokers. This subject is a large one, so large in fact that we are compelled to postpone its treatment for a succeeding issue, together with the presentation of water softening and purifying, fuel economizers, condensers, and combustion engineering in general. On these pages, therefore, we are confining the presentation to what is really another problem in transportation—the transportation of water instead of coal.



One of two turbine driven centrifugal feed pumps operated by the Beacon Oil Co. It has a normal capacity of 300 gallons of hot water per minute against a total net head of 510 feet. The turbines operate on a normal boiler pressure of 200 pounds.

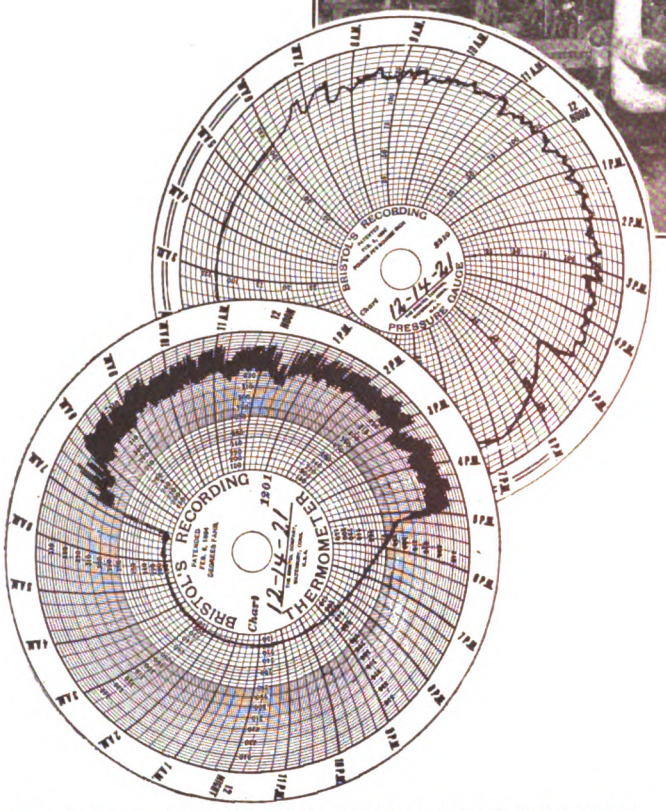
(The Goulds Mfg. Co., Seneca Falls, N. Y.)

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The drainage of a steam system is an important factor in its efficient operation. This outfit has been devised to keep the condensation always under pressure, to retain practically all the heat units in the condensate and to return it to the boiler at the maximum highest temperature. Each ten degree increase in temperature of feed water represents one per cent fuel saving. The illustration shows apparatus installed in the Pennsylvania Sugar Company's plant in Philadelphia.

(Morehead Mfg. Co., Detroit, Mich.)

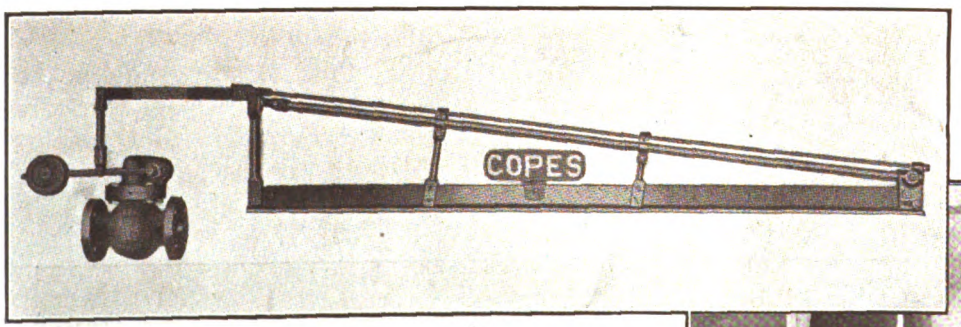


These charts show the effect of pressure and temperature control in a drainage system such as illustrated above. They are taken from recording meters at the Long-Hall Laundry, at Kansas City. The condensation is returned from the laundry machines to the boiler at a temperature around 330 degrees. Under ordinary methods this would be pumped back at 212 degrees or 140 degrees lost for the cycle, corresponding to 14 per cent in fuel efficiency.

(Morehead Mfg. Co., Detroit, Mich.)

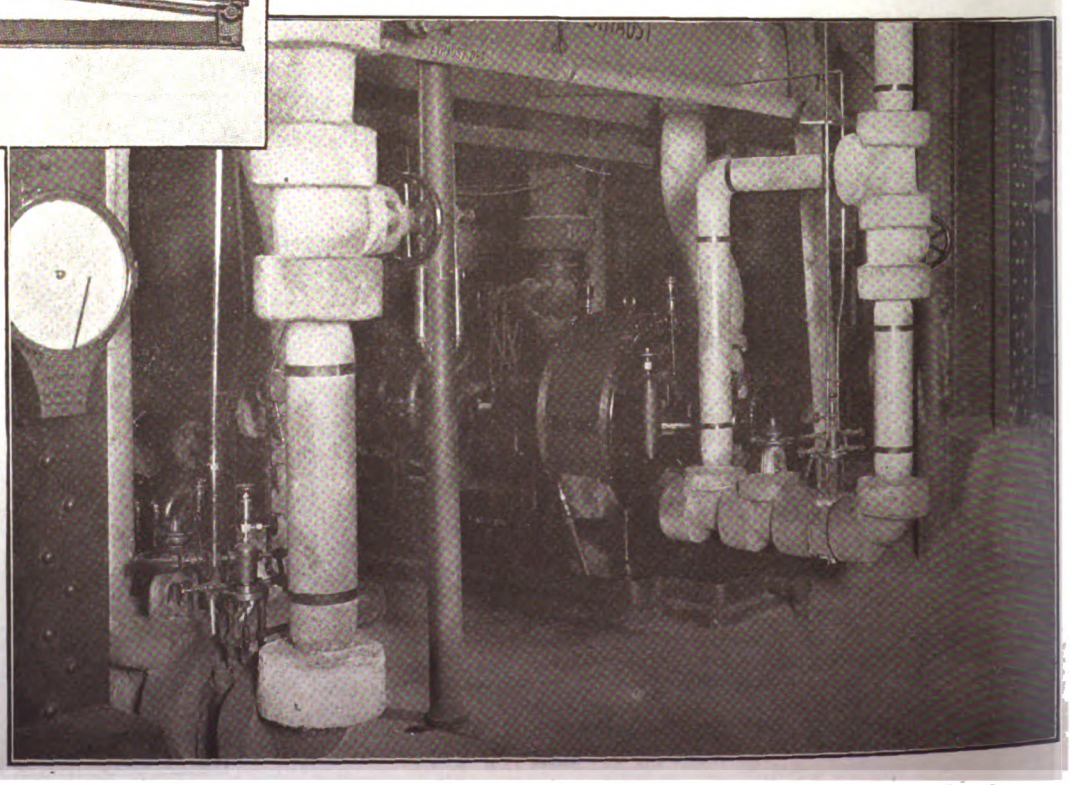
We have seen how coal in a modern boiler room flows through the plant largely by gravity or is "pumped" through it by conveyors. We have seen how ashes are handled by conveyors and by steam jets similar to the injectors formerly almost universally used for boiler feeding and now frequently found as reserve auxiliaries. The parallel in transportation methods between coal, ashes and water is quite a close one. And the methods of handling the mechanical transportation of water, or in other words its pumping into the boiler, show almost as much improvement as do the methods of handling and transporting coal during the past twenty or thirty years.

Just as coal is measured on its way to the boiler in the modern plant, so is feed water too, automatic metering and recording devices (which will be shown in a later issue) being utilized for this purpose. And just as there are alternative ways of handling coal by means of different types of conveyors, so too there are different ways of managing the transportation of feed water. The modern centrifugal boiler feed unit, as contrasted with the injector and the reciprocating steam pump, is an example of this. The turbine itself, a modern development in power plant engineering, in connection with the development of single or multistage centrifugals of high efficiency able to handle hot water against high boiler pressure heads, has enabled the development of a compact, reliable and easily con-



Regulating the boiler feed gives the operating engineer another opportunity for improving boiler efficiency. This apparatus regulates the rate of feeding in proportion to the demands for steam. Thus instead of flooding the boiler with a great quantity of comparatively cold water, it is fed continuously at the best rate for efficient operation. One might call it an automatic boiler tender.

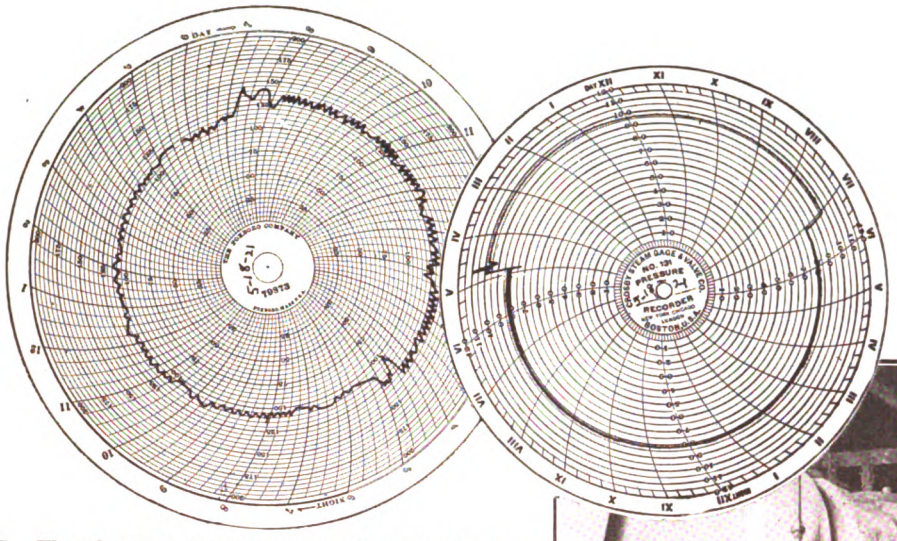
(Northern Equipment Co., Erie, Pa.)



Here is an installation of the device shown above at the Minneapolis General Electric Co., Minneapolis, Minn. It consists of regulators and pump governors with a recording gage which shows the rate of feeding and which produces a chart similar to one of those shown below.

(Northern Equipment Co., Erie, Pa.)

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A & B. The chart at the left was made at the boiler and shows the fluctuations in pressure that occurred during twenty-four hours. The chart at the right was made after steam from the same boiler had been regulated to constant pressure by the regulator shown above.

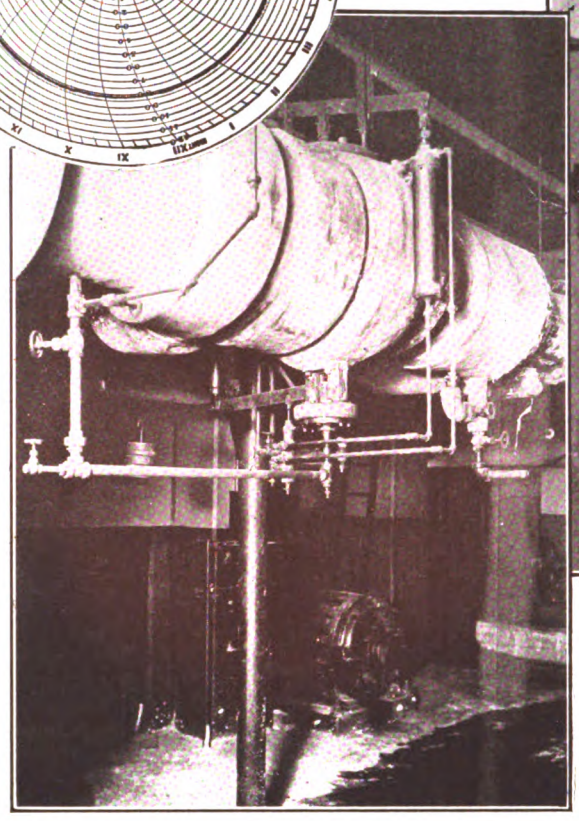
(G. M. Davis Regulator Co., Chicago, Ill.)

trolled boiler feeding unit.

No longer is the boiler water column carefully watched by the boiler tender who formerly operated pump or injector by hand when required. The operation is now an automatic one so that the feed water is fed practically continuously at a rate varying with the demands for steam.

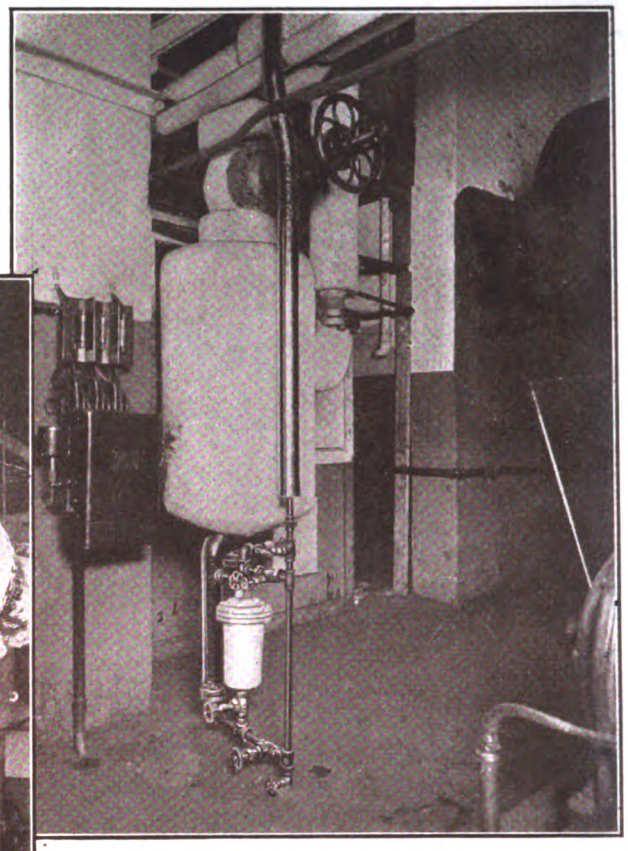
One of the secrets of efficient boiler operation is to get the feed water back into the boiler at as high a temperature as is practical or possible. Each 10 degree increase in the temperature of this feed water represents roughly a one per cent fuel saving. Aside from the feed water heaters and fuel economizers, therefore, we have mechanical devices to drain the steam system to prevent the condensate from robbing the exhaust steam of its heat units and to return it to

(*Continued on Page 28*)



It is not enough to regulate the coal, air and water supply to the boiler. For the efficient operation of steam-driven machinery the boiler pressure output must be regulated also. Here is a large hydraulically controlled regulator in the Whitman & Barnes Mfg. Co.'s plant at West Pullman, Ill. It is used to reduce a variable boiler pressure of 135 pounds to a constant pressure of 100 pounds during the day and a slightly lower pressure during the night. The charts shown above illustrate how the boiler fluctuations are ironed out by a regulator of this sort.

(G. M. Davis Regulator Co., Chicago, Ill.)

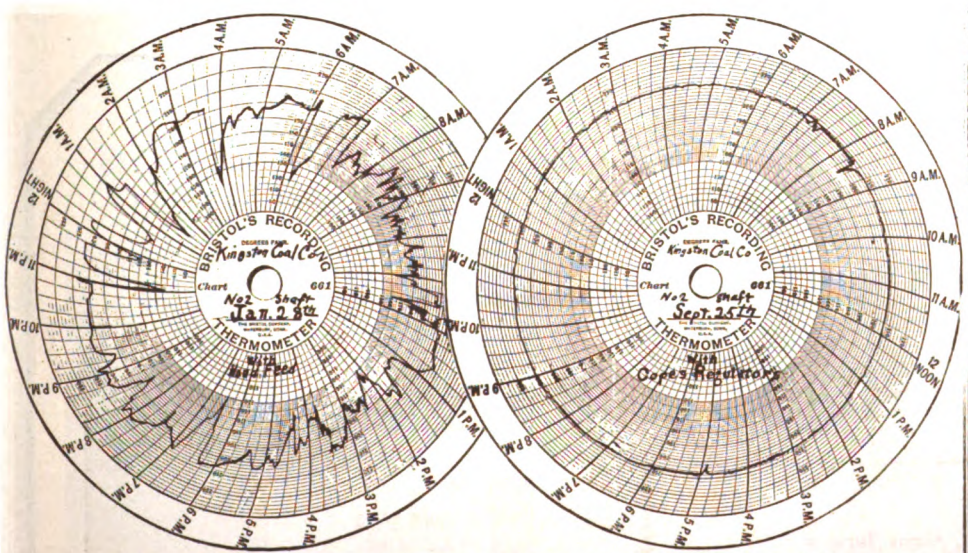


Turbines and engines must be protected against damage from slugs of water which are likely to pass through the steam lines and cause great injury and expensive repairs. A vital part of the up-to-date power plant is the steam separator which arrests these slugs on their way from the boiler to the engines or turbines. This illustration shows such a separator which is drained by a trap at the bottom.

(Armstrong Machine Works, Three Rivers, Mich.)

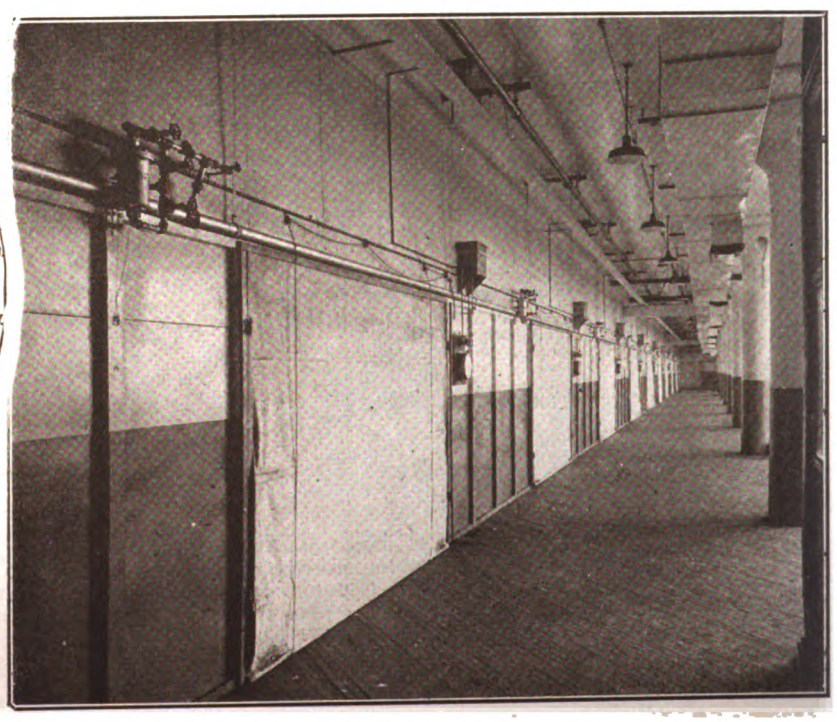
Steam traps are important items in eliminating water from steam lines and thus preventing more rapid condensation and loss. The illustration below shows an installation of steam traps in the body dry room steam coil system at the Cadillac Motor Car Co.'s plant, Detroit.

(Armstrong Machine Works, Three Rivers, Mich.)



These charts were made by a recording thermometer connected to a regulator similar to that shown on the left-hand page. The one at the left hand shows the irregular temperatures secured with hand feeding. The chart at the right was made with the automatic regulation in effect, and preserves a practically uniform record for the twenty-four hours.

(Northern Equipment Co., Erie, Pa.)



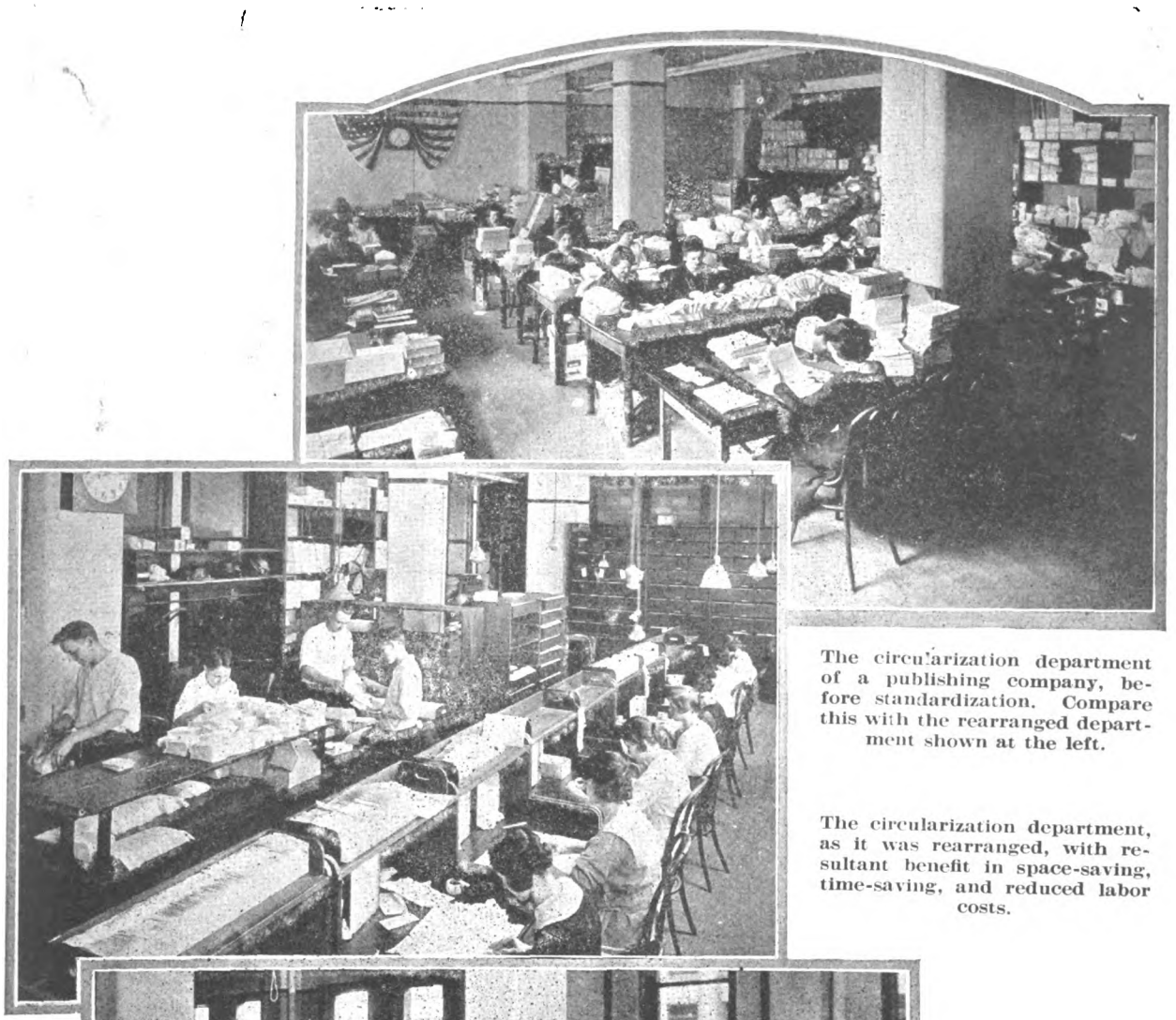
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Standardization in the Office

The Production Department Is Not the Only Field for Cost Cutting

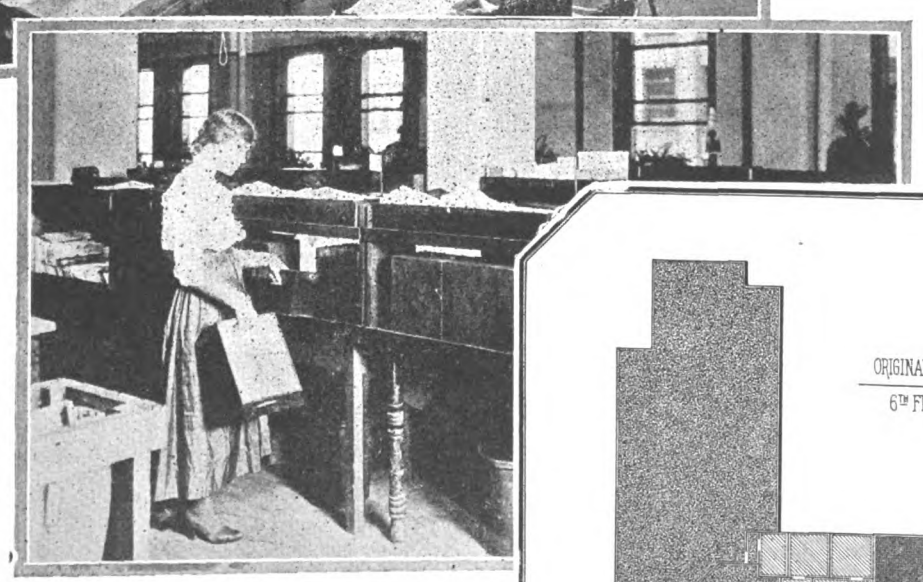
By W. H. Leffingwell

President, the Leffingwell-Ream Company

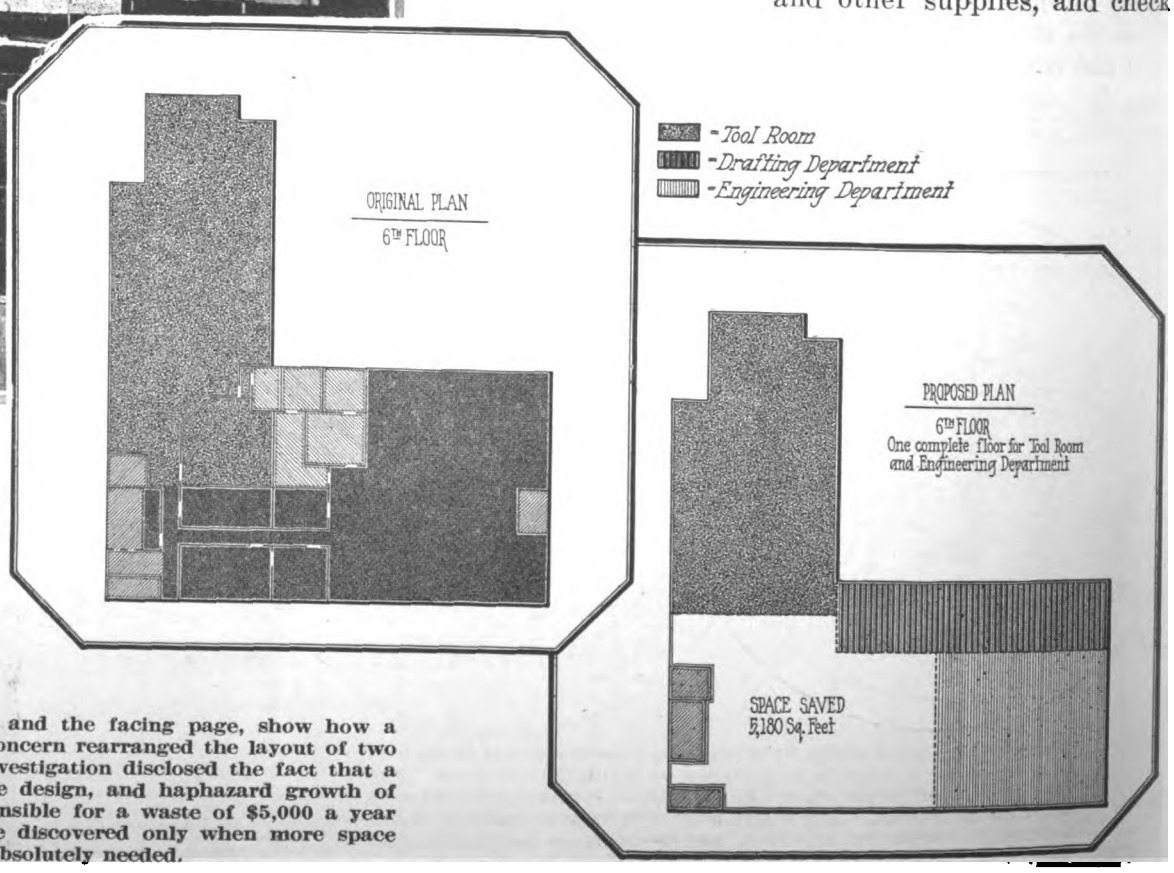


The circularization department of a publishing company, before standardization. Compare this with the rearranged department shown at the left.

The circularization department, as it was rearranged, with resultant benefit in space-saving, time-saving, and reduced labor costs.



Above is shown in detail the rear of one of the work tables adopted in the office shown in the first two illustrations.



The four plans, on this and the facing page, show how a Buffalo manufacturing concern rearranged the layout of two floors of its building. Investigation disclosed the fact that a wide variety of furniture design, and haphazard growth of departments, were responsible for a waste of $5,000 a year in office space. A waste discovered only when more space was absolutely needed.

A CERTAIN concern in New York decided recently to install bookkeeping machines. The management had practically agreed on a particular make of machine, and in fact had consulted salesmen and secured estimates which showed that eighteen of these machines would be required at a total cost of $22,000. Before the final purchase order was given, however, the company decided to make a test and base its selection on the results of this test.

Four different makes of machines were entered, the test lasted six weeks, and at the end the management had learned, among other things, these two important facts.

First, that another type of machine than the one originally selected was more efficient for the particular work of the company's bookkeeping.

Second, that only nine machines would be required, whereas estimates made prior to the test had said that eighteen would be necessary.

It cost $2000 to make the test—to pay the operators, provide supervision, stationery and other supplies, and check

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Sitting at a typewriter in this position is not only uncomfortable and fatiguing, but the cramped position makes sustained speed impossible.

At first glance, the difference in position may seem negligible; but it represents all the difference between good work and bad.

up the results. But here is what the test saved, in dollars, at the lowest reckoning:

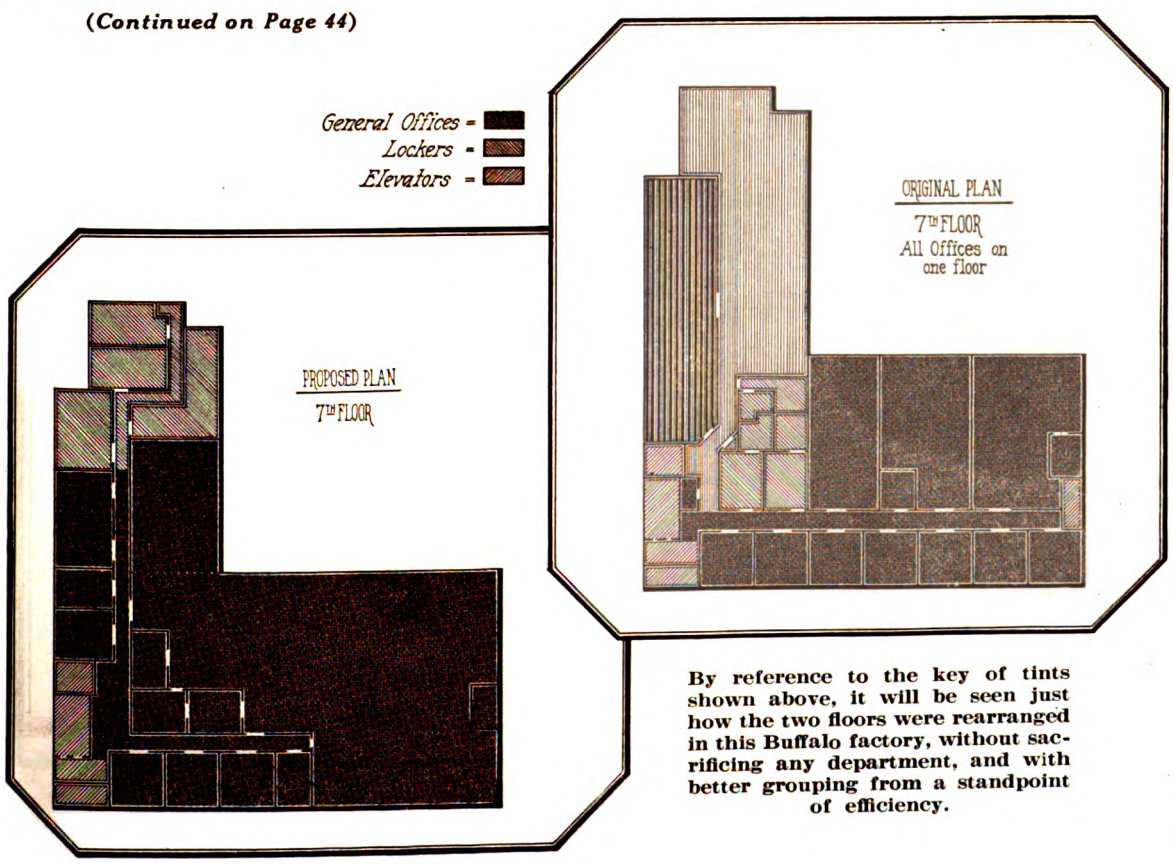
Cost of 18 machines originally considered	$22,000
Cost of 9 machines with the best record	9,000
	13,000
Cost of nine operators per year	9,000
	22,000
Cost of test	2,000
NET SAVING, first year	$20,000

As a matter of fact the saving is more than $20,000. Nine machines require less floor space than eighteen machines, for example, and in the larger cities rent is an important item of office expense. Each operator of a bookkeeping machine requires about 50 square-feet of working space for herself and her equipment. A saving of nine machines meant a saving of 450 square-feet, and at $2 a foot that was $900 a year less rent. In the same way, the reduction of the number of machines and of operatives meant a reduction in the amount of supervision required and a saving of repairs and other expenses of maintenance. These savings apply not only to the first year, but to all succeeding years.

(Continued on Page 44)

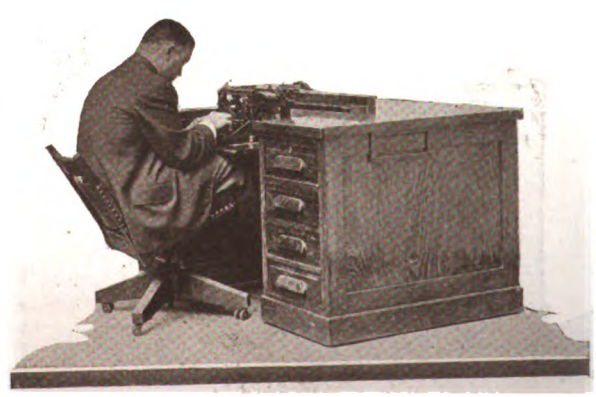


Tables, in place of desks, materially helped the efficiency of the clerical office shown above. A saving of $4,500 on cost of equipment, and 1000 square feet of floor space.



By reference to the key of tints shown above, it will be seen just how the two floors were rearranged in this Buffalo factory, without sacrificing any department, and with better grouping from a standpoint of efficiency.

Below—Not merely the man's health, but his work and the whole "tone" of the office are lowered when this sort of thing is permitted.



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What Is Real

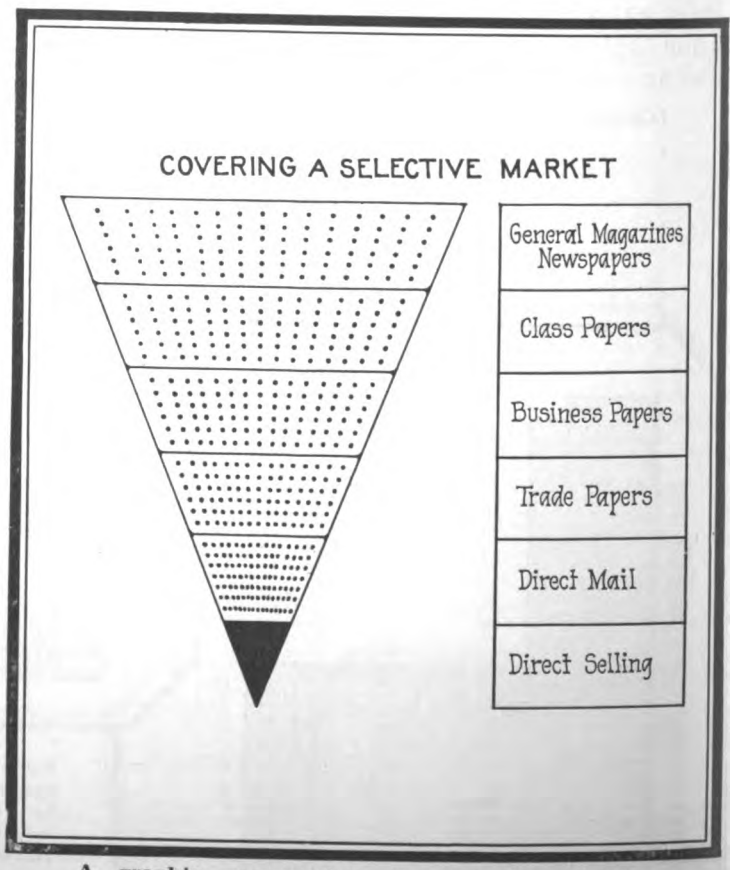
BY E.



What results may be expected from the expenditure authorized? This is the question that must be intelligently answered today—and it can be.

MANUFACTURERS who have undertaken advertising with studied sincerity are thoroughly convinced of its value to modern business. Many who came to use it as a personal or corporate vanity, have remained to consider it a powerful business force and have changed their tactics accordingly. Even the bankers who not long since held it in equivocal esteem are now inclined to admit its economic validity. Laboring under a new universal demand for economy, however, advertising must prove its claim as a justified expense in re-establishing the profit margin. And to do this, some measure of advertising efficiency must be devised.

This means of necessity, first, logically arranging its facts, evident or demonstrated, into the semblance of a science; next, approximating further steps on tendencies observed; and, finally, measuring its ability to produce results within definite limits of expense. Results and economy can be forecasted only as definitely as



A graphic presentation, showing the actual nucleus of the market at the apex of the triangle, while the diverging sides indicate the additional waste of broader circulation.

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Economy in Advertising?

PAYSON BLANCHARD

rules of cause and effect are certain.

One of the first principles to establish, is its use in relation to factory production and market conditions. Advertising is a force, one of the forces propelling the mass products. Products may be visualized as a sphere rolling along on the surface of economic conditions, its mass representing the volume of sales, and its volocity equivalent to the rate of selling or turnover of products. Momentum is Mass times Volocity. Momentum of products is the result of forces including advertising.

Deductions from such a figure may be numerous and detailed, but this fact is evident: With the momentum of products equivalent to normal factory capacity and smooth sailing in economic conditions, the propellant required is normal. These circumstances, are, of course, hypothetical, but they afford fixed conditions on which to base the proportion of efforts to results. They are the same fixed conditions on which comparative cost accounting is based.

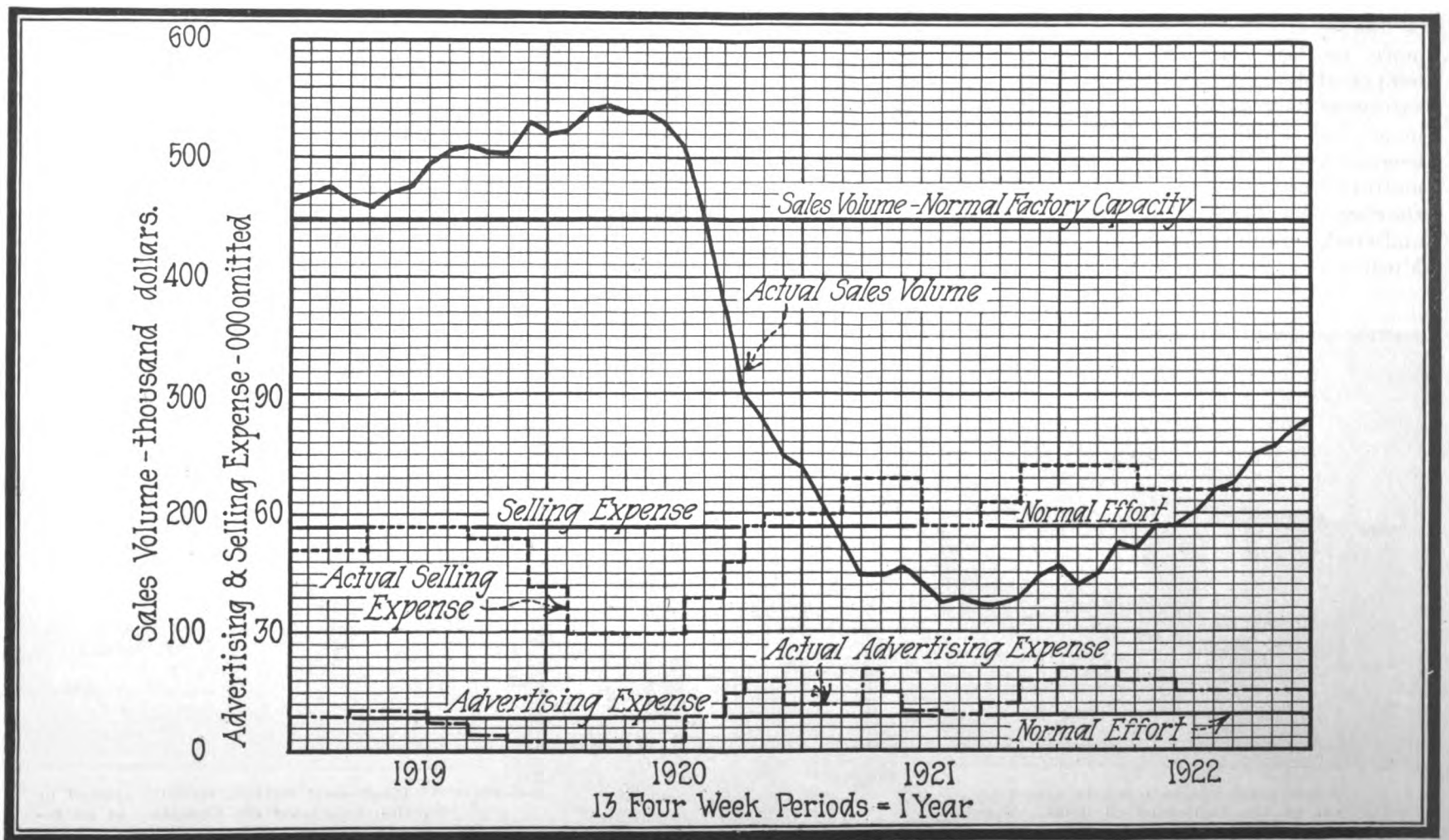
Classification of Expense	Applied to—
Admin. & Executive Expense	*Direct Advertising*
Research and Analysis	*Letters*
Service, Supplies & Misc. Exp.	*Bulletins*
Office Expense	*Catalogues & Handbooks*
Compilation of Market Data	*Novelties*
Contracts for Space	*Technical Catalogues, Directories*
Layout and Copy	*Buyers Guides & Year Books*
Art and Illustration	*Trade Papers & Business Papers*
Paper, Printing, and Binding	*Class & Broader Circulation*
Novelties and Favor	
Mailing	

Advertising costs should be controlled by a very definite plan of distribution, outlined, of course, to fit the particular case, but recognizing standard factors.

The factors can be maneuvered to relations of experience. During the past period of prosperity, products were moved with almost no effort in selling, factory capacities were overtaxed, and those phases of economic conditions which were not stabilized by federal control were completely overpowered by market demands and may be disregarded. In this instance, the momentum of products was high, economic conditions presented a down grade, and the force required was minimum. Selling effort was used to pacify customers, to keep a good will attitude in the interest of future business and changed conditions. Advertising should have followed the same policy, instead of carrying on aggressive sales effort, and should have used only sufficient force to keep the company's name and product before the prospective market.

(Continued on Page 51)

A chart, such as the one below, aids in "putting the story in a nut-shell"—both for the advertising manager, and for showing the man who pays the bills.

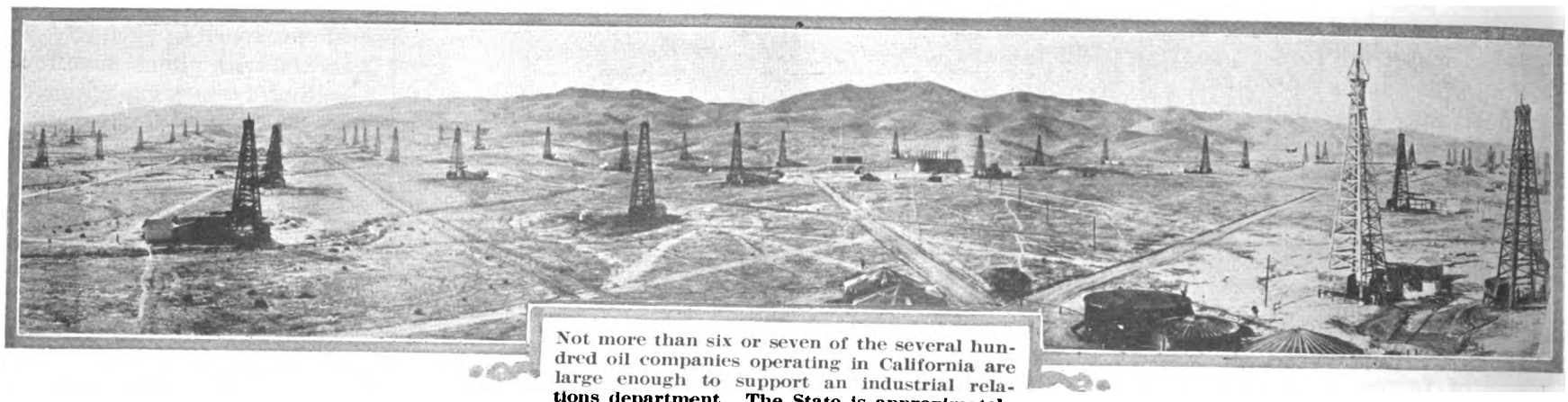


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Industrial Relations in the California Petroleum Industry

By Roy Willmarth Kelly

Manager of Industrial Relations of the Pacific Oil Company, Associated Oil Company, Amalgamated Oil Company, and Affiliated Companies



Not more than six or seven of the several hundred oil companies operating in California are large enough to support an industrial relations department. **The State is approximately 750 miles long and the divisions of most companies are separated from each other by great distances.**

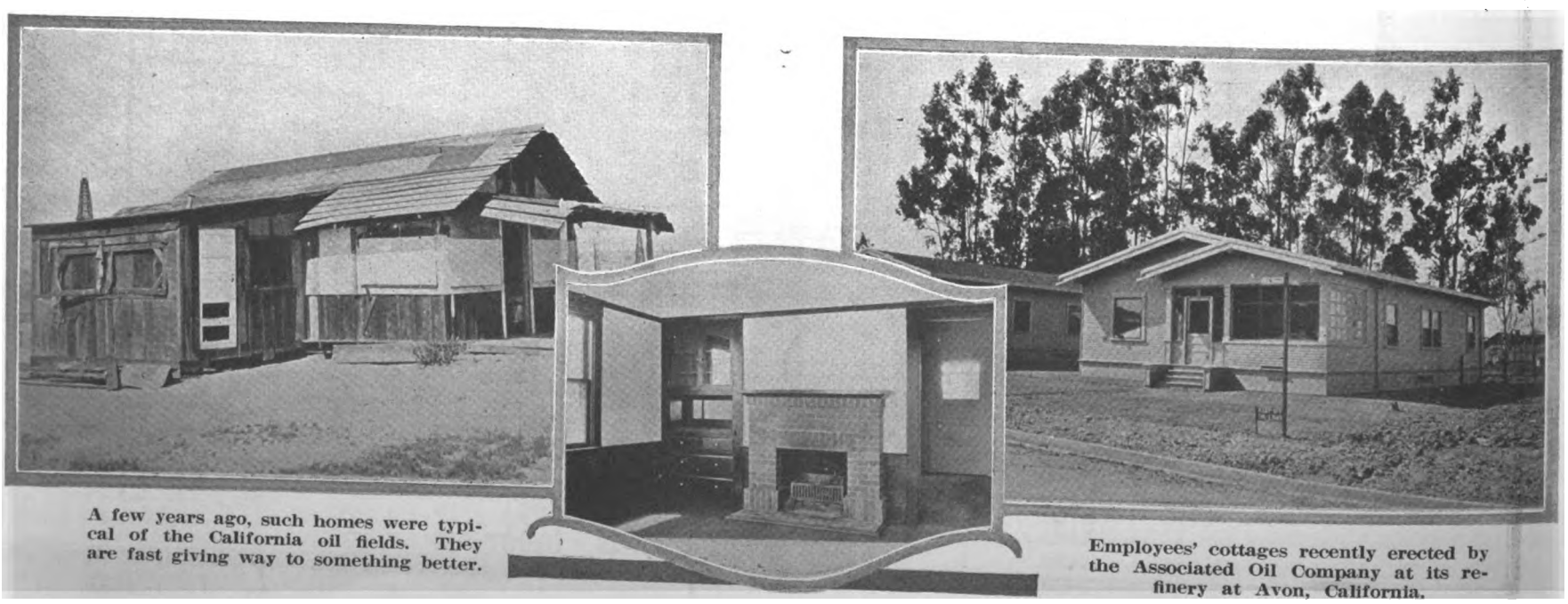
ORGANIZED industrial relations activities are a comparatively recent development in the California petroleum industry. Not more than six or seven of the several hundred companies operating in the State are large enough to support an industrial relations department. At the present time only two companies have functionalized personnel departments, under a single manager. Nearly all of the companies have made more or less successful attempts at housing, sanitation, safety or first aid, and occasional individual plans have been developed covering such matters as pensions, profit sharing, hospitals, training, and stock selling to employees. Much more systematic work has been done and more progress has been made among employees in the various refineries than in the producing fields, pipe lines, or sales departments. This is largely true because of the fact that the State is approximately 750 miles long and except in the case of the refineries, the divisions of most companies are small and separated from each other by great distances.



REDUCTION IN LABOR TURNOVER

The change shown by this chart was in large part due to the establishment of the Industrial Relations Department in August, 1920.

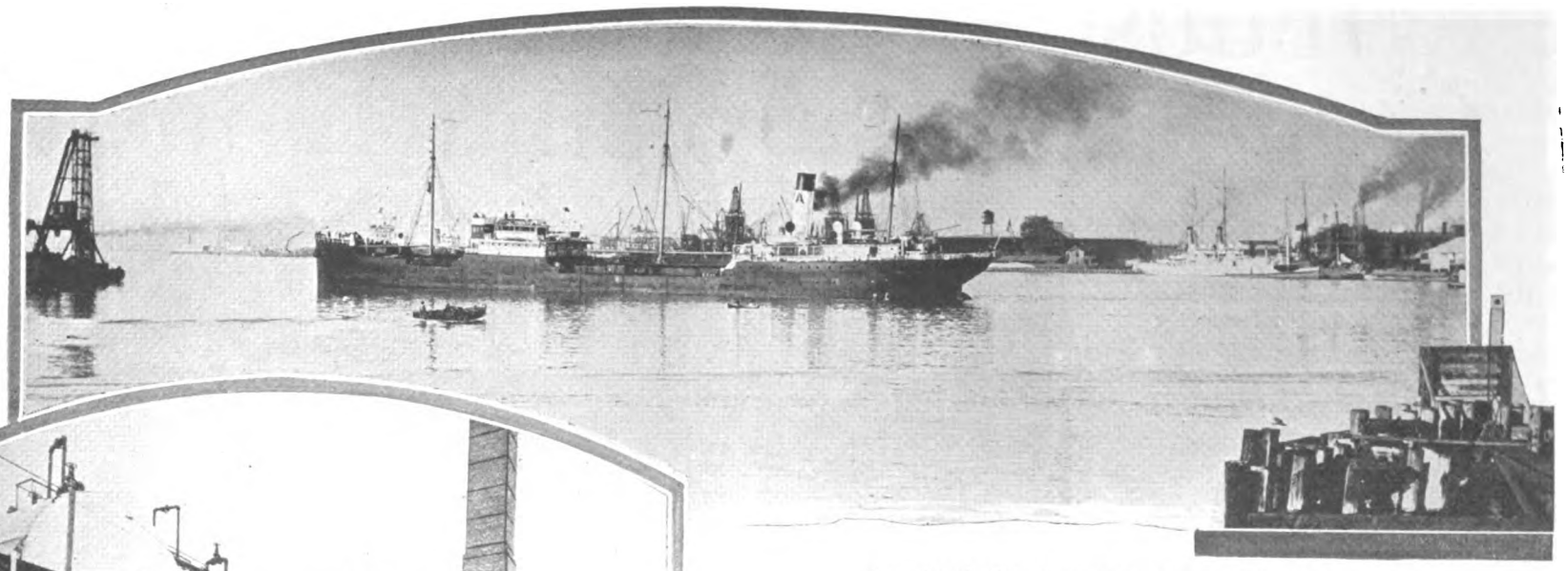
The character of the employees engaged in the oil industry makes personnel work particularly easy and unusually productive of immediate results. Of the 6,000 persons on the pay rolls of the sales department, refineries, pipe lines, and producing fields of the Pacific, Associated and Amalgamated Oil Companies, less



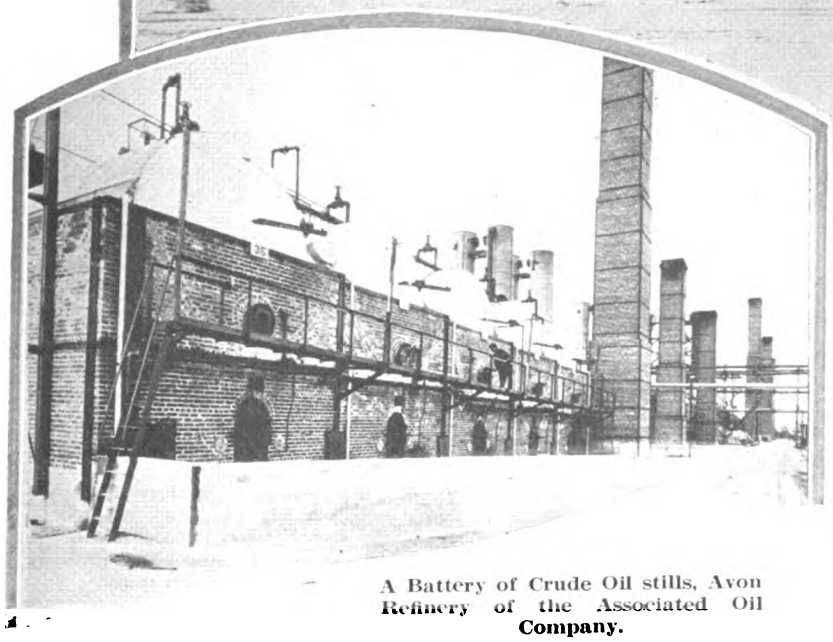
A few years ago, such homes were typical of the California oil fields. They are fast giving way to something better.

Employees' cottages recently erected by the Associated Oil Company at its refinery at Avon, California.

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Associated Oil Company Tanker "Frank H. Buck" at the Alameda Wharf.



A Battery of Crude Oil stills, Avon Refinery of the Associated Oil Company.

At the right—one of a system of reports which has resulted in gathering valuable information on hours and conditions of work in the various departments.

METHOD OF REPORTING OVERTIME

Part of a system of periodical reports issued by the Industrial Relations Department

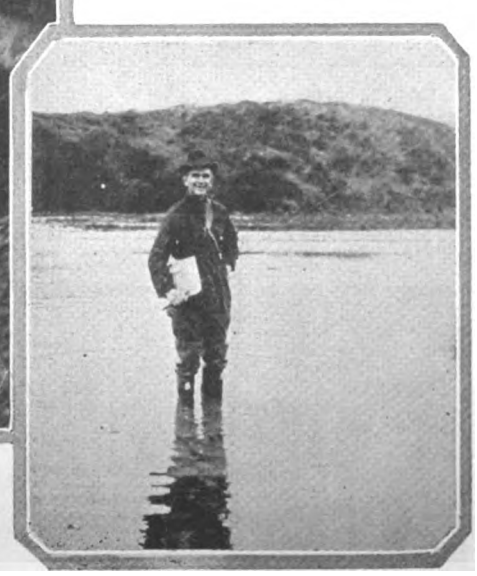
Division	No. Times Worked	No. of Hours	Cost	% of Pay Roll
A	12	70	54	0.07
B	760	2043	1772	0.4
C	186	418	338	0.5
D	398	816	678	0.6
E	403	1261	1117	0.9
F	1870	4132	3273	1.0
G	579	1877	1561	1.06
Total	4208	10617	8973	0.7



The girls' basket-ball team, San Francisco General Offices, Associated Oil Company.



Not only executives, but employees as well are able to enjoy such vacations as this.



From the President down, everybody has an opportunity to go fishing and hunting.

than 5% are foreign-born. Over 70% are native-born and of native-born parentage. Even the most isolated oil fields have good grammar schools and are situated reasonably near the best of high schools. What is true of these companies is true in greater or less degree of all California oil companies. Efforts which would be fruitless under less favorable circumstances, meet with a ready response among our people.

This field, which was ready to respond so quickly to the best type of good management, had not been overlooked by professional labor agitators. So successful were they in sowing the seeds of dissatisfaction that in September, 1921, immediately upon the expiration of the existing agreement between operators and employees, a strike was called, affecting the major part of the industry of the State.

Just what was this "Agreement," and what did it cover? It was a plan presented to the oil industry during the war period, as a temporary measure only, by Mr. Verner Z. Reed of Colorado, a dollar-a-year man representing the Secretary of Labor. The mediation program agreed upon was not required by law. It was established informally and was applied only to a small part of

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the oil industry in the United States. In 1920 it was "signed up" by only 26 of the several hundred companies in California. The terms agreed upon included provision for a perpetual government board, known as the Federal Oil Board, to have the final voice in determining wages and working conditions. Elective committees of workmen and an appointed salaried official known as an "Adjuster" were expected to care for all minor grievances arising under the agreement.

It was obvious from the first that the strike was not over wages or working conditions. Living costs had decreased so generally that the average worker, even without recourse to statistical data, was aware that the demands made upon his pocketbook had been materially diminished. Official statistics confirmed this, and a dollar a day decrease was accepted by the men of all companies, including those who went out on strike, as well as those who stayed at their posts. Working and living conditions were also declared to be entirely satisfactory.

(Continued on Page 36)



An attractive distributing station of the Associated Oil Company at Patterson, California.

Regulation type of field dormitory, Amalgamated Oil Co., Los Angeles. Equipped with steam heat, screened sleeping porches, and separate room for each man.



A pumping station of the Associated Pipe Line, near Fresno, California.

DAYS LOST FROM ALL CAUSES

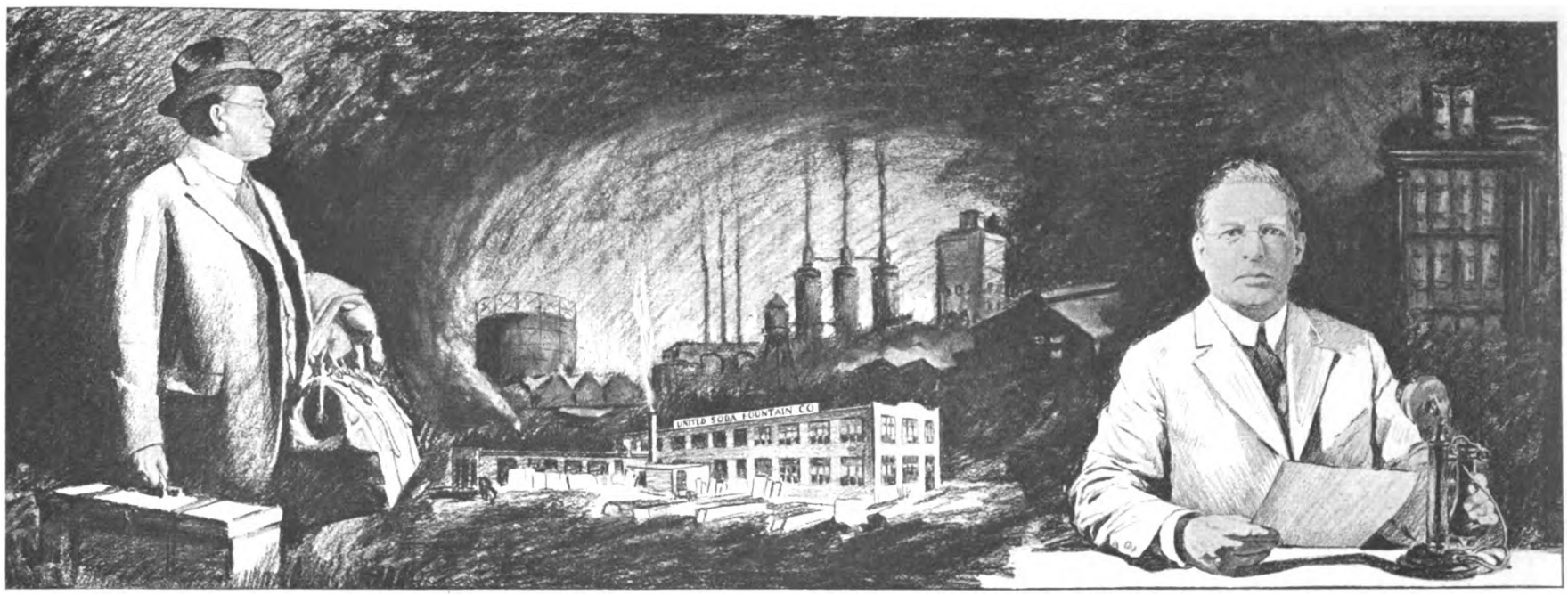
Report covering a four months' period issued by Industrial Relations Department. Similar reports are issued monthly. Amount of private time is large because men are employed 7 days per week.

Division	*Sickness*	*Accidents*	*Private Time*	*Days lost per man in average working force.*
A		12	206	2.2
B	201	85	456	2.5
C	143	129	437	3.8
D	353	197.5	329	5.4
E	173	157	363	5.6
F	726	549.5	2365	6.2
G	214	63	227	6.4
Total	1810	1193	4383	4.8

Reports such as this, when intelligently studied and correlated, furnish the Industrial Relations Department with a mine of information on which to base its work for better relations and understanding.



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In three short years he put it across

But he had dreamed about it for fourteen years. Haven't YOU dreamed long enough?

THIS is an advertisement for salesmen; for accountants; for technical men—for any man who knows one department of business, and wonders how he is going to get to the top, either in the business where he now is, or in a business of his own.

It has to do with a man named R. Lee Smith, now Vice-President and General Manager of the United Soda Fountain Company of Boston; one of the most successful concerns of its kind in the country.

For fourteen years he worked and dreamed; then he added the training of the Alexander Hamilton Institute to his work.

And in three short years he had made the dreams of fourteen years come true.

Thirty-eight; married; and a family

Starting as a salesman he became sales manager of a company making soda fountains and their equipment. He was successful in his department—sales. (Most men who enrol with the Institute *are* successful in the one department of business where their experience has lain.) He was thirty-eight. (Most men who enrol with the Institute are between twenty-five and forty-five.) He was married. (A majority of the men who enrol with the Institute are.)

And *this* was the driving power behind his decision: "I wished to afford my family advantages," he wrote, *"which otherwise they would not have."*

"I had dreamed for years of my own business"

"For fourteen years I had been a salesman and sales manager," he continued. "I had dreamed for years of my own business organization, but my work gave me no understanding of business other than that which concerned selling. *I knew nothing of production, financing, or business promotion. Your Course and Service gave me an understanding of these things."*

He clipped a coupon from an advertisement like this. With the knowledge which the Institute brought to him, and with its encouragement and guidance, he organized the United Soda Fountain Company, erected a factory and started production. Straight thru the period of business depression the business has steadily grown; and now Mr. Smith plans to double its factory space and its output.

So three years work *with training* did what work alone could never have done.

A book that has made dreams come true

You who read Mr. Smith's story on this page are already familiar with the Alexander Hamilton Institute. You know how many thousand men there are who, like Mr. Smith, give it credit for having shortened their path to larger income and greater success.

The whole story of the Institute has been printed fully in a 118-page book—a book that should be in every thoughtful man's library. It is called

"Forging Ahead in Business"

For any man who is asking himself "Where am I going to be in business ten years from now?" there is a copy of this book without obligation. We would like to place it in the hands of *every* ambitious man. It helped Mr. Smith to give his family "advantages that otherwise they would not have had." Send for your copy now.

Alexander Hamilton Institute
508 Astor Place, New York

Send me "Forging Ahead in Business" which I may keep without obligation.

Name .....
Print here
Business
Address .....

.....
Business
Position .....

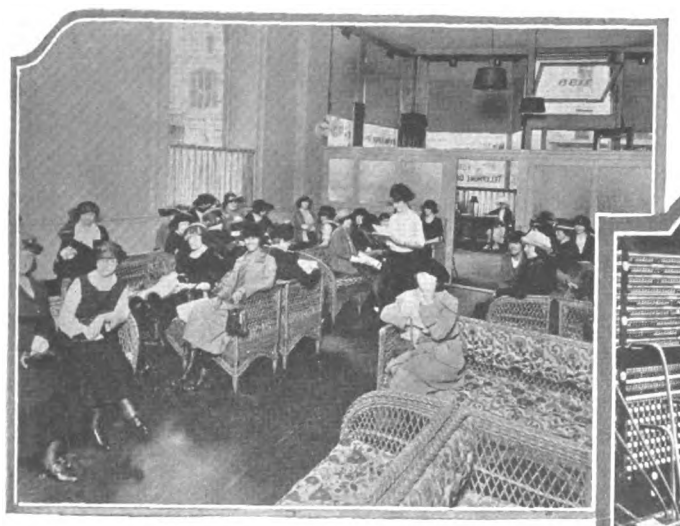
Canadian Address, C.P.R. Building, Toronto; Australian Address, 42 Hunter Street, Sydney

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The Making of a Telephone Girl

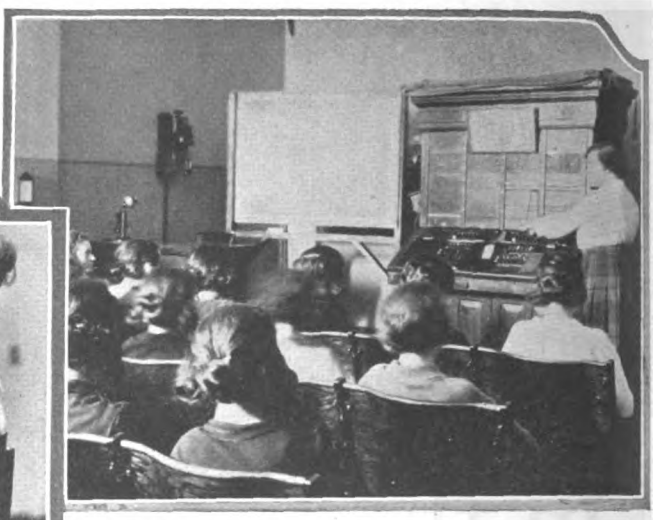
BY ANNA L. WHITE



A busy morning in one of the employment offices; applicants waiting to be interviewed.



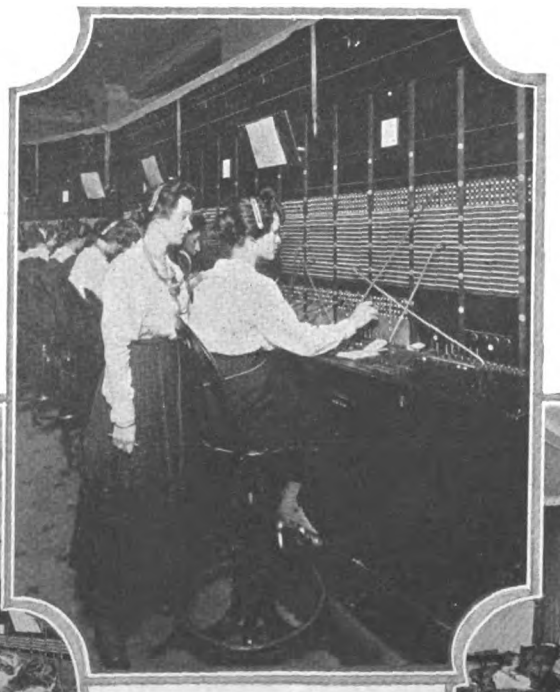
Operator on the "A" Board, establishing a connection.



Instructor presenting a lesson to a class of student operators

IT was fascinating to watch her. A quick-moving young girl sat at the switch board, saying over and over in a pleasant, well-modulated voice, "Number, please?" with a courteous rising inflection, and repeating number after number, while her hands were busily engaged putting in plugs, pulling out plugs, as far as she could reach on each side of her, answering with rapid precision the telephone calls which came to her from the subscribers of the company. She was one of the experienced operators of the New York Telephone Company. To the uninitated, it seemed impossible that any human being could coolly keep track of so many flashing little lights, could handle without tangle so many cords, and could continuously serve with accurate promptness so many calls.

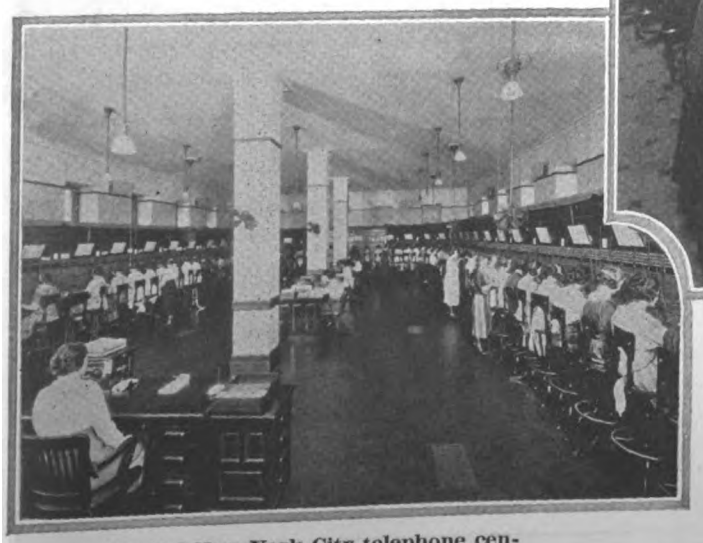
Student receiving personal instruction from a supervisor.



The New York Telephone girl attains this degree of proficiency through many interesting steps. Possibly she receives her first impetus to become an operator some time before she ever applies to the employment department of the company for a position. She may have the first idea of it occur to her when a lecturer from the New York Telephone Company visits the grammer grades of the public school which she attends and gives the pupils an interesting talk on service, courtesy and good enunciation. If that is the case, then when she goes to apply for a position in the company she is already impressed with the points which the New York Telephone Company emphasizes in the training of its operators.

Her impressions in regard to

(*Continued on Page 53*)

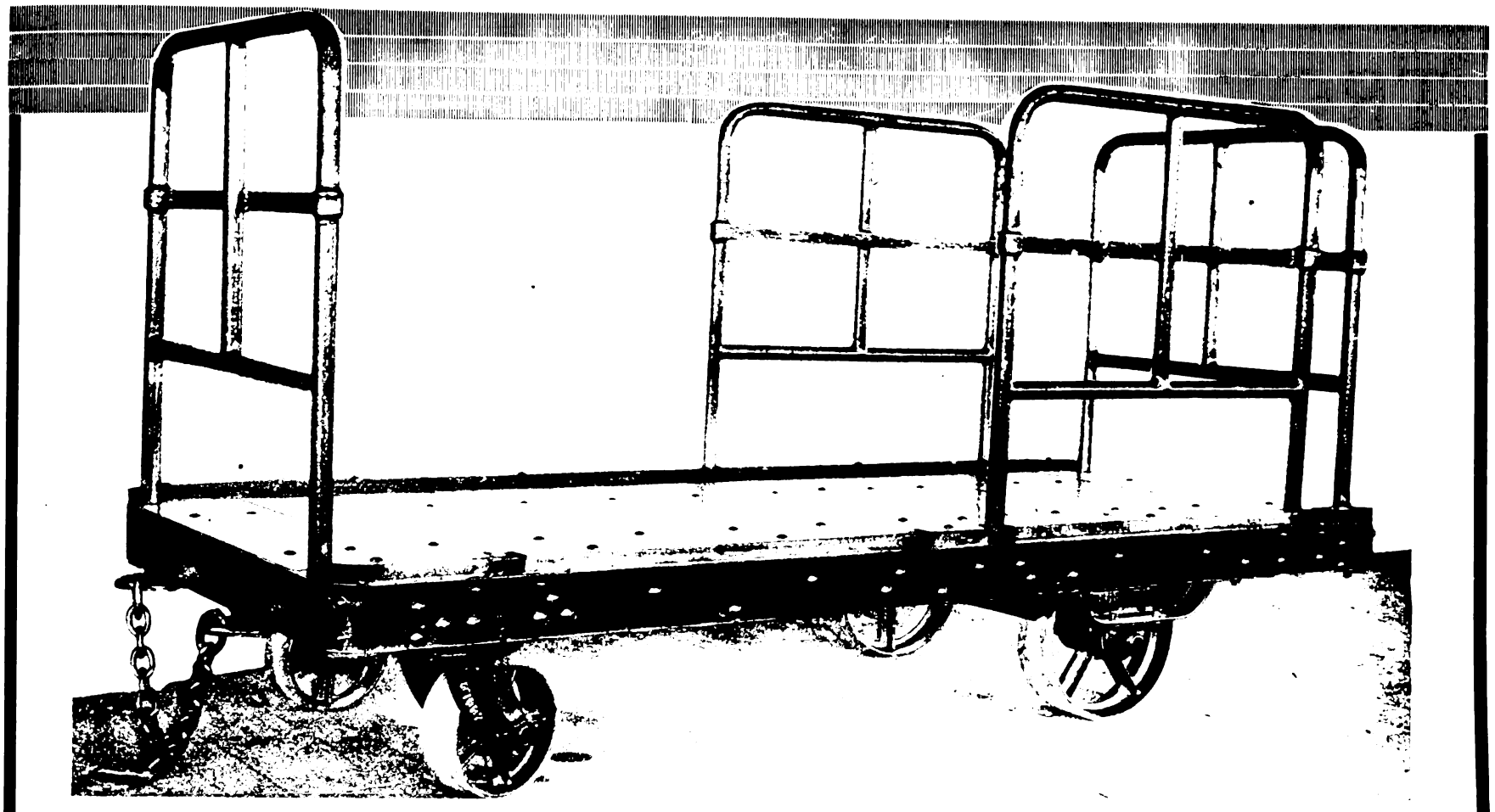


Typical New York City telephone central office (Chelsea Exchange) under normal working conditions.



Operators spending their relief period in the central office rest room (Melrose Exchange).

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It Would Be an Expensive Engine Driver Who'd Use Brakes on a Pull

Yet, that is what you are putting your tractor up against when you operate it with trailer equipment improperly designed for the work. You are forcing it to pull against set brakes.

Nor does drawbar pull always vary in direct ratio with the weight of the trailer. Drawbar pull depends upon trailer design. Trailer designing is a specialty today, based on experience.

Buy your trailers of specialists. It is the best economy you can practice.

Remember that low tractor operating cost is usually the result of high trailer efficiency.

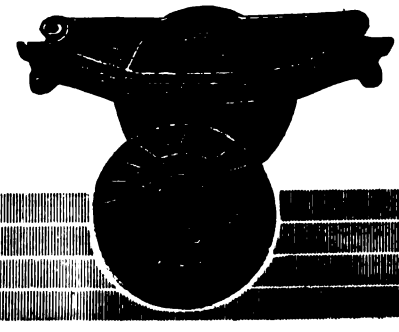
The trailer illustrated is a recent speial "K & J" design worked to meet special conditions. It is applicable, however, to quite a wide range of industrial use. Platform is low, being only 14 inches from floor. The platform is supported on four heavy longitudinal channels tied by channel ends. Trailer built to carry 4000 lbs. Rear wheels on individual axles and with Hyatt Roller Bearings. Caster stem turns on vertical roller bearings with ball bearing swivel and Hyatt Bearings in wheel.

A standard line of "K & J" Trailers, ranging in capacities from one to three tons, is regularly supplied. This line comprises both the all-steel type and the wood platform type. Hyatt Roller Bearings are standard equipment in "K & J" Standard Trailers.

Write for Bulletin 510.

The Kilbourne & Jacobs Mfg. Co., Columbus, O., U.S.A.

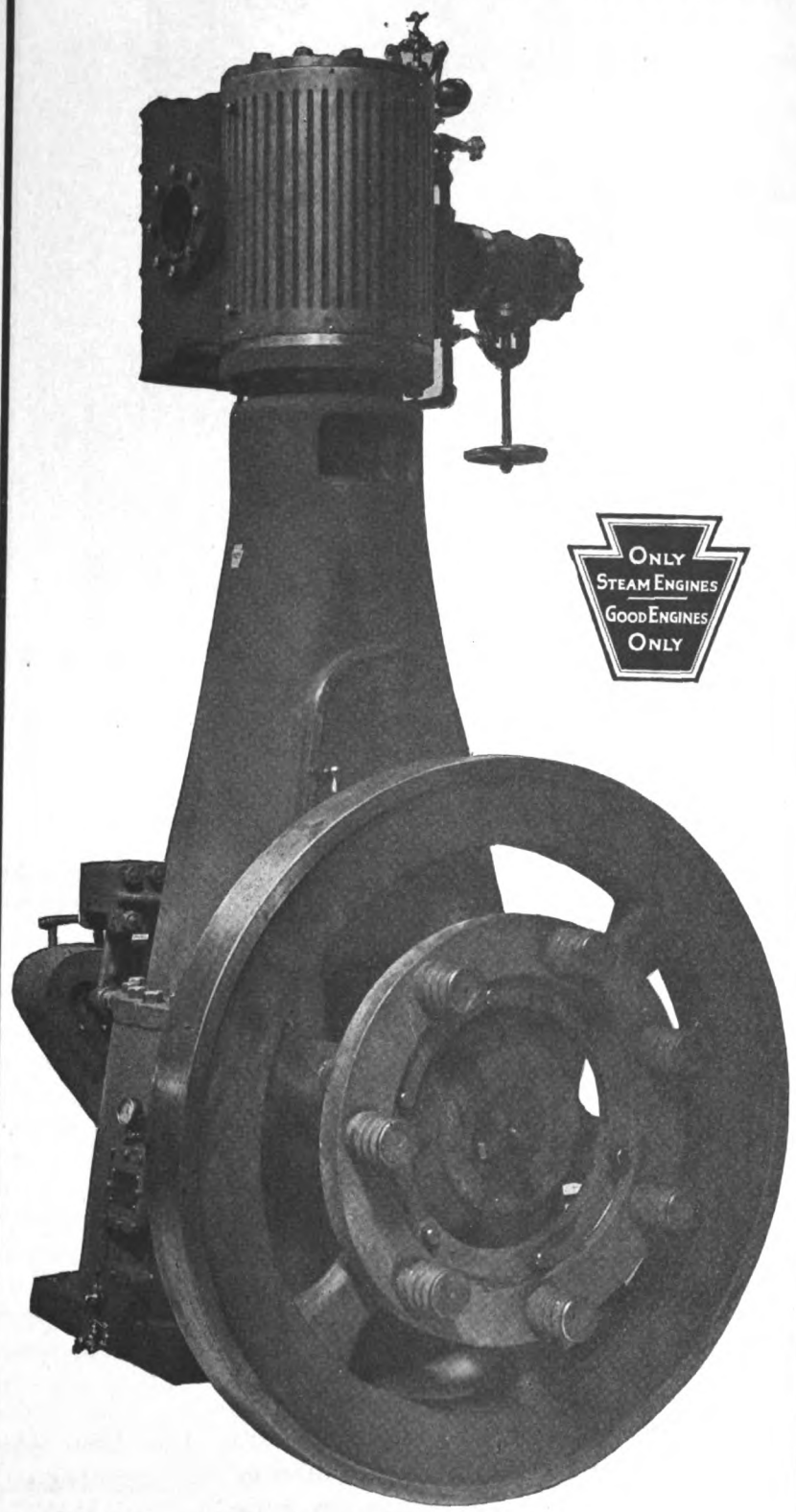
New York Office, 120 Broadway----Connections in all parts of the world.



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TROY ENGINES

Where Dependability Counts Most



In the Gas Plant

The excessive demands of the gas plant are easily met with these Special Vertical Type Troy Engines.

The constant stopping and starting is a real test of steam engine efficiency.

Troy Engines stand up under all conditions.

They are the result of over thirty years experience in the building of small steam engines and the many thousands in use are continually proving that they are *The Best Known Small Steam Engines Made.*

Our Catalog No. 6 will tell you why.

TROY ENGINE & MACHINE COMPANY

TROY, PENNSYLVANIA

"Only Steam Engines; Good Engines Only"

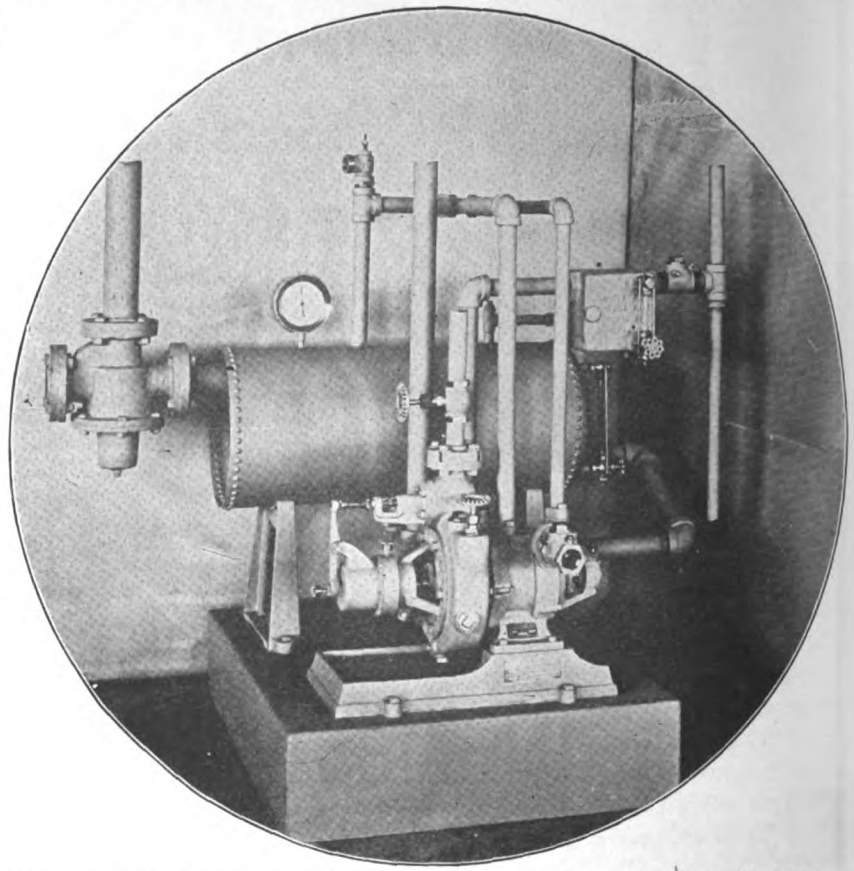
Inside the Boiler Room

(Continued from page 17)

the boiler at the maximum highest temperature. This system in turn is subject to automatic pressure and temperature control; and graphical meters which show performance, hour by hour, and which make permanent records for the chief engineer's guidance and information are found in the modern plant.

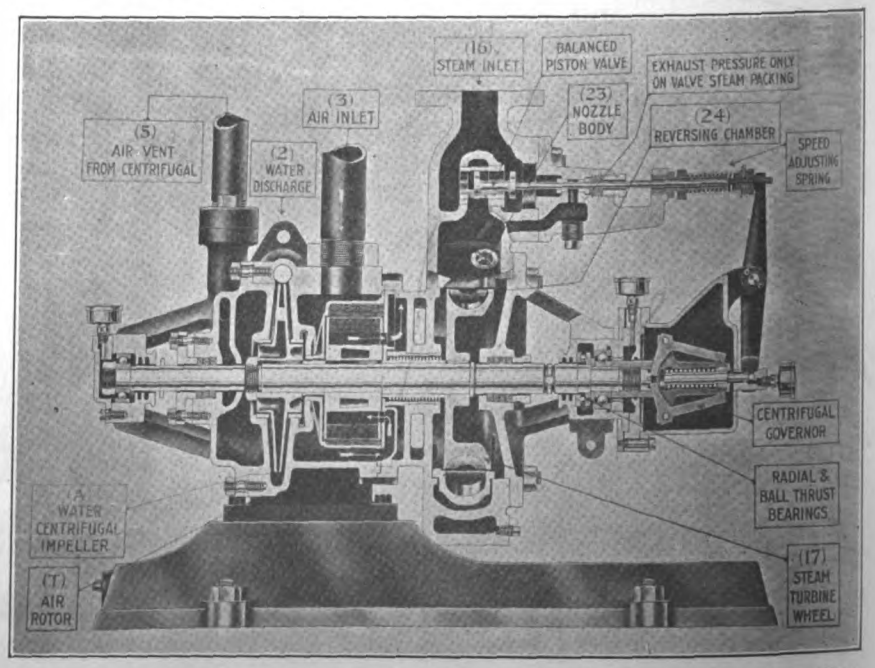
Close akin to the regulation of water entering the boiler is the regulation of steam leaving it. Automatic regulating valves, hydraulically controlled, are used to reduce variable boiler pressures to slightly lower constant pressure. Here again graphic charts come in for the guidance of the engineer and the plant manager.

In fact, the principle of *performance records* is just as much a part nowadays with boiler plant operation as it is in any production department.



A turbine driven unit especially designed for use in connection with heating or drying systems where the pump is called upon to maintain a vacuum on the heating system and also to return the hot water and condensation against a pressure.

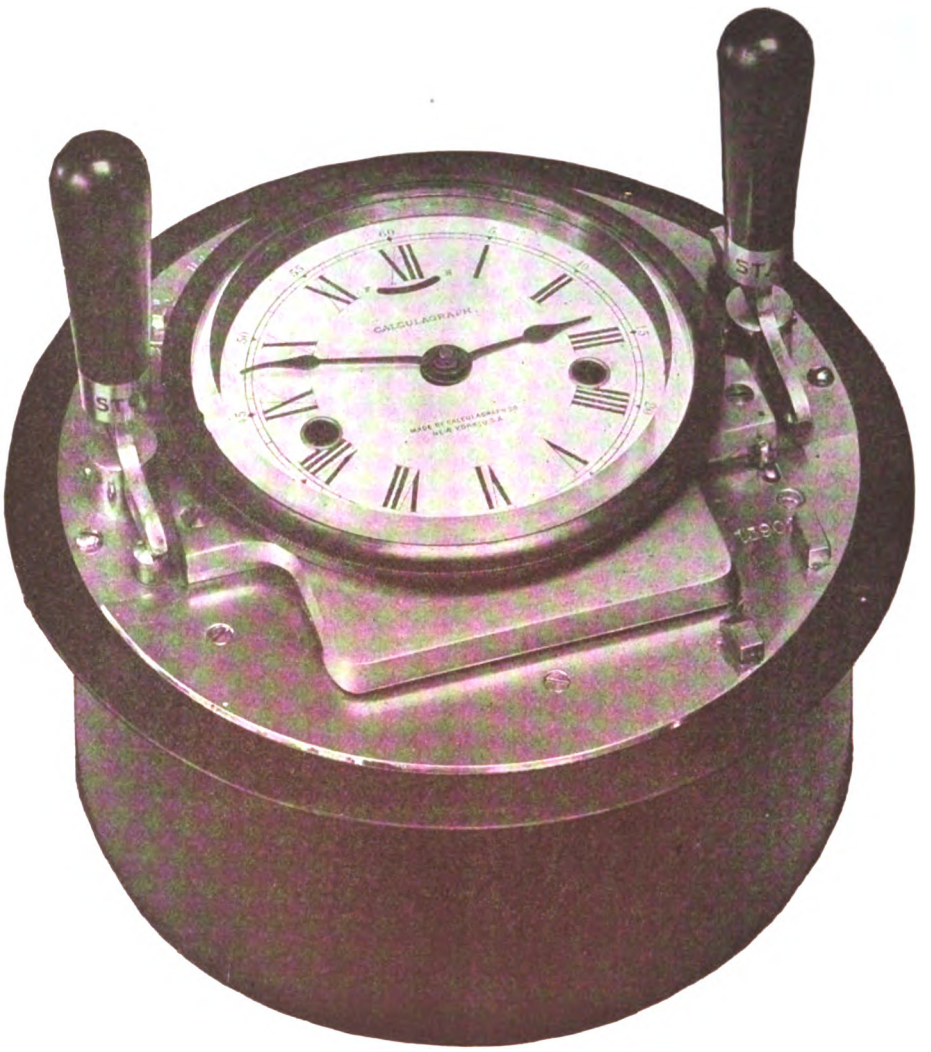
(Nash Engineering Co., South Norwalk, Conn.)



The unit consists of two independent turbine pumps built in one casing. One pump handles the air, the other the condensate, the two being separated in a receiver under vacuum before entering the unit. This arrangement results in a large saving of horsepower because the condensate alone (about one-eight of the volume handled), is delivered against the discharge pressure.

(Nash Engineering Co., South Norwalk, Conn.)

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Elapsed Time---the most important item in industry.

Labor time is the basis of wage settlement, of production costs and of selling prices.

Yet, in the face of its importance many manufacturers today are measuring the time of jobs by antiquated methods.

What about *your* time recording machinery? Is it the best you can buy? Does it record mechanically *elapsed time?*

Or, does it merely print "starting" and "stopping" time, leaving the work of figuring elapsed time to clerks with the ever present chance of human error?

The Calculagraph records not only "time started" and "time stopped" but most important of all *elapsed time.* It gives you a printed record, right on the job ticket, of the elapsed time.

Any number of employees can use one Calculagraph without confusion of records. Its operation is simple. One backward-forward-movement of the right hand Calculagraph lever when the job starts, a pull on the left-hand lever when the job is done and the time record is complete.

One model prints the elapsed time in hours and minutes, another type in hours and tenths of an hour. There are also different models for computing elapsed time for maximum periods of twelve, twenty-four and sixty hours.

You will be interested in our booklet "Elapsed Time Records." Send for it today.

THE CALCULAGRAPH

THE ELAPSED TIME RECORDER

34 Church Street, New York City

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Economical Handlin
Via The Portable

Over 5,000 Scoop Convey



ABOVE—Loading ashes into truck at the power plant of the Society of Useful Manufacturers, Paterson, N. J. Note ease of feeding and full load.

Industry's big problem today is the *reduction of production* costs.

The close attention given to this subject by careful executives has revealed the great savings which can be effected by handling coal, ashes and other materials in the most economical way. As a result mechanical handling is rapidly replacing the old hand methods.

The Scoop Conveyor, which has replaced hand labor in over 5,000 plants, is a complete material handling unit—simple in design, construction and operation. Its adaptability enables it to perform many different tasks, its portability makes it ever ready to meet with changing conditions.

The Scoop Conveyor replaces from six to ten men on many jobs. Its first and operating costs are low, so that figured in dollars and cents,



ABOVE—The Scoop Conveyor is fed by scraping the material over the "scoop end" which can easily be buried in the pile.



ABOVE—The flexibility and economical operation of these machines enable the Atlantic Coast Electric Railway Co., Asbury Park, N.J., to save $300 per day in unloading their coal from cars to storage and then reclaiming to boiler room.

BELOW—At the Hyde Park Gas Co., Scranton, Pa. Three ton trucks are loaded in 5 minutes by one man and the Scoop Conveyor.

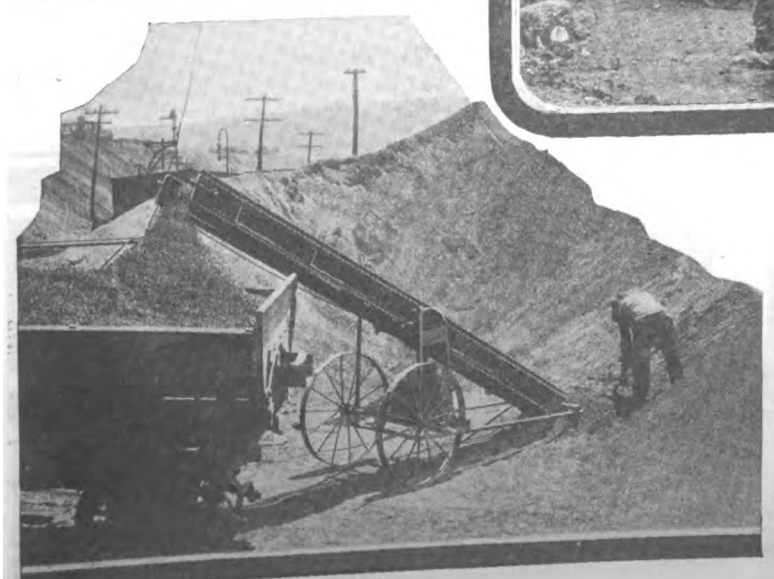


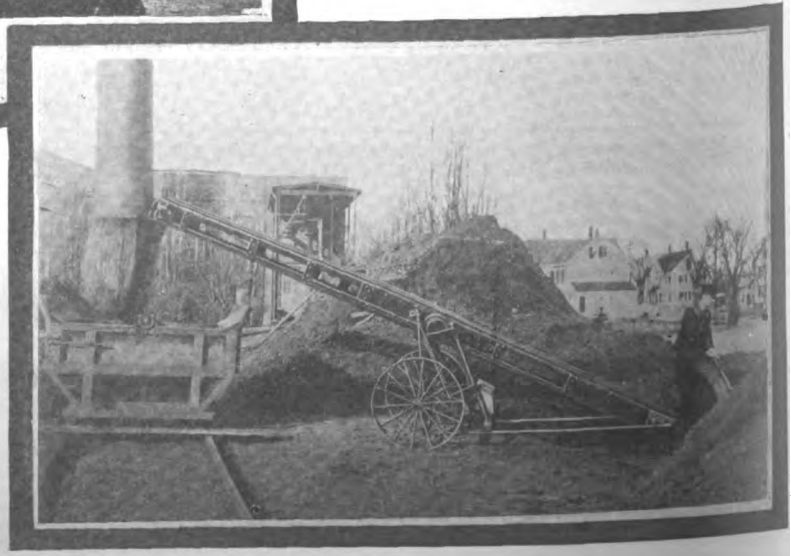
PORTABLE

PASSAIC,

LEFT—The Scoop Conveyor loading an electric industrial truck at the Star Porcelain Co., Trenton, N.J. This is an ideal installation where coal is stored at a distance from the boiler room.

BELOW—Reclaiming coal from storage to rail dump truck for delivery to boiler room at the Dennison Manufacturing Co., Farmingdale, Mass.





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ll of Loose Materials

b coop Conveyor

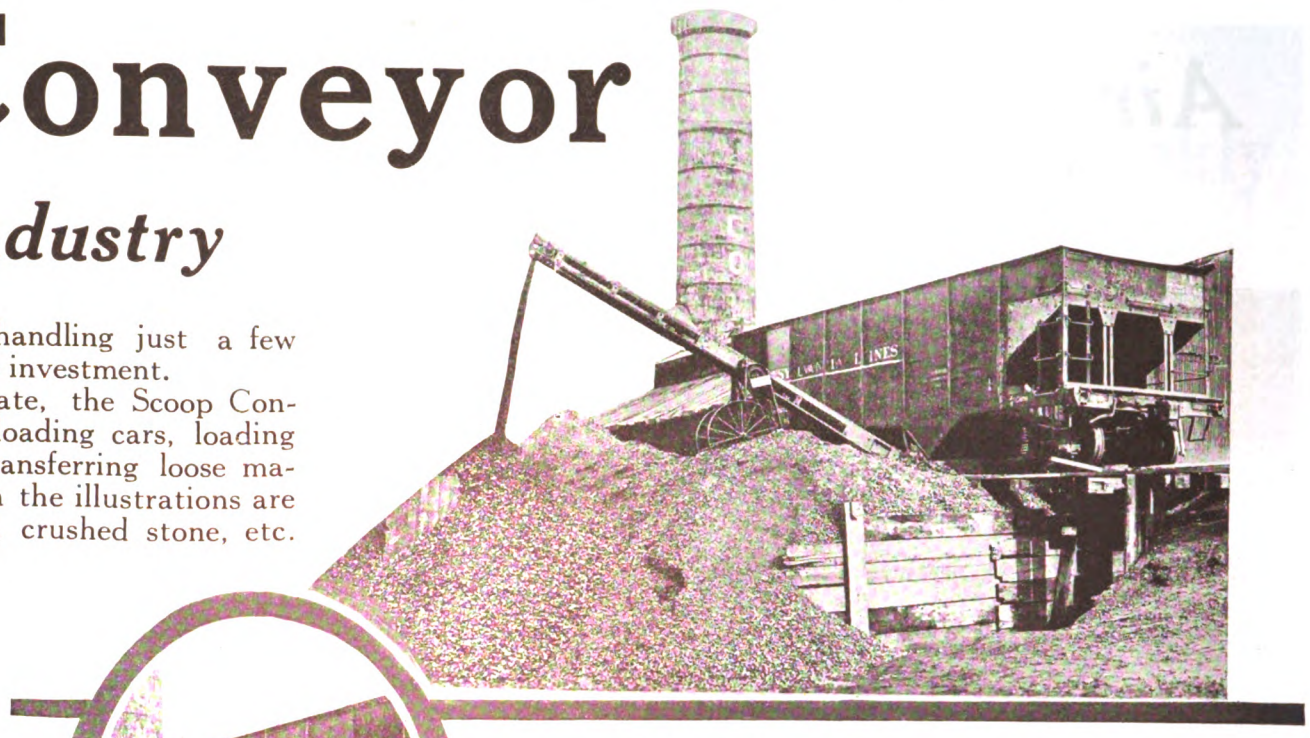
are Serving Industry

the savings which it effects in handling just a few hundred ton, make it a first class investment.

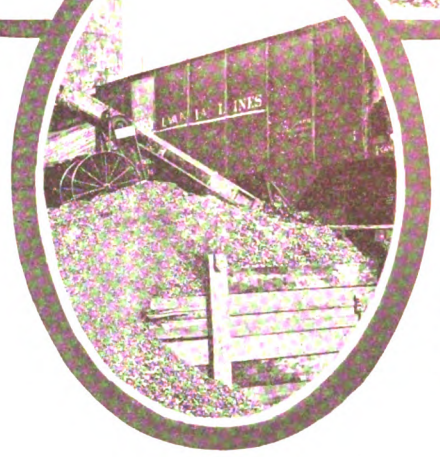
As these illustrations indicate, the Scoop Conveyor saves handling costs in unloading cars, loading trucks, storing, reclaiming or transferring loose materials. The materials shown in the illustrations are coal, coke, ashes, sand, gravel, crushed stone, etc. There is, however, no limit to the kinds of material it will handle, as small packages, boxes, brick, bags, tile and similar commodities are also successfully handled by many operators.

Regardless of what you handle or how you handle it, our engineers will be glad to co-operate with you by studying your problem and suggesting the equipment which will prove most economical for your work.

Write for booklet No. 63.



ABOVE—Unloading 50 ton cars in two to three hours. Carey Salt Co., Kansas.



LEFT—A pit or track hopper is not necessary when the Scoop Conveyor is used to unload hopper bottom cars. The "scoop end" is placed under the car and the belt carries the material away as fast as it flows thru the hopper opening.

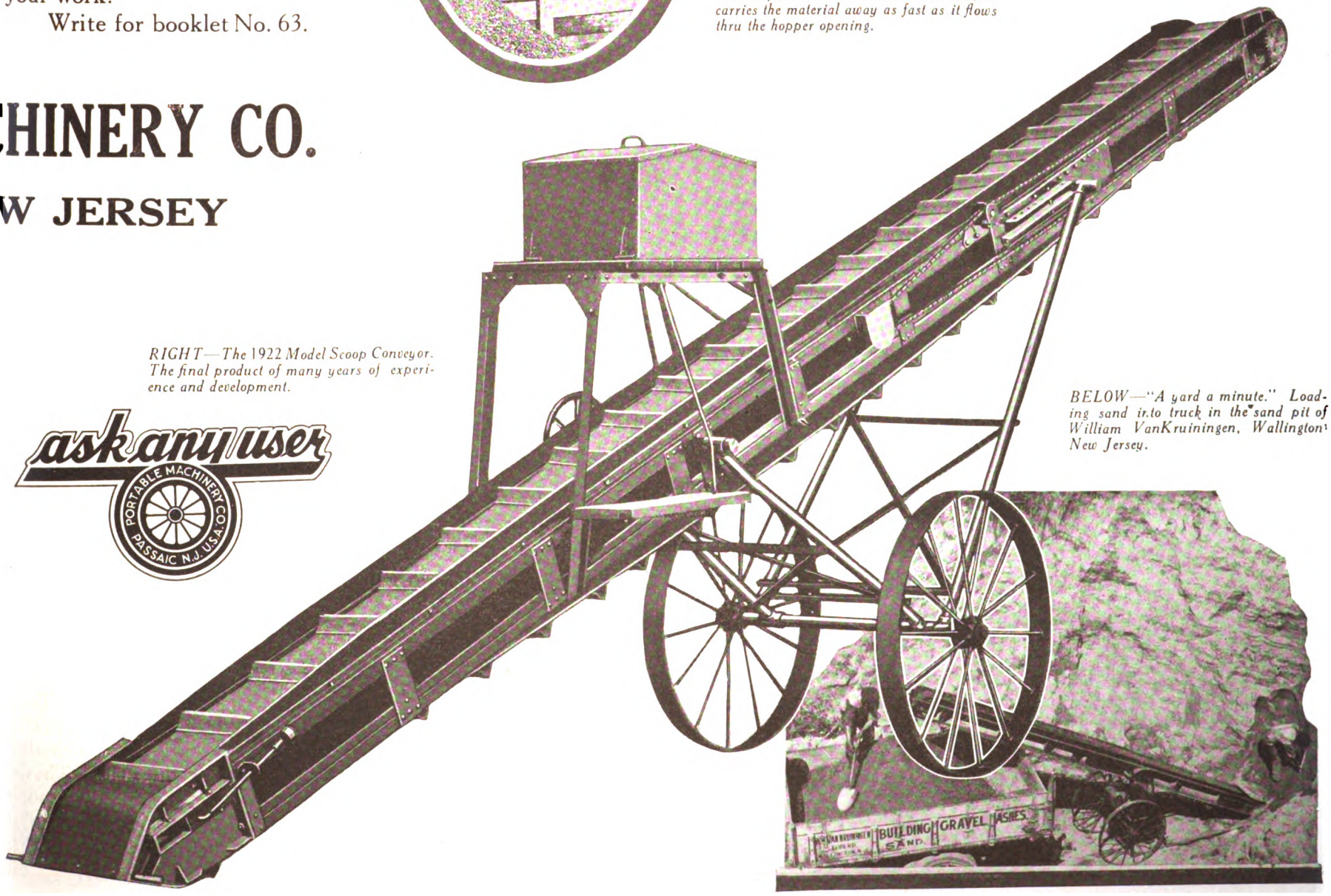
CHINERY CO.

EW JERSEY

RIGHT—The 1922 Model Scoop Conveyor. The final product of many years of experience and development.

ask any user

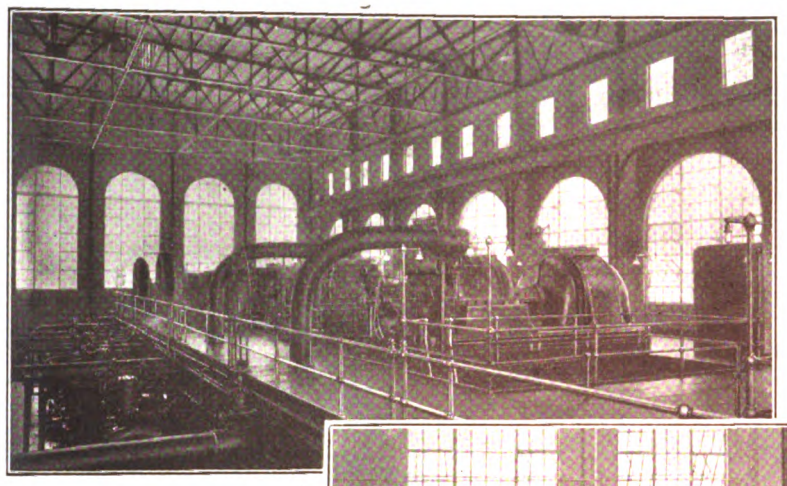
PORTABLE MACHINERY CO. PASSAIC N.J. U.S.A.



BELOW—"A yard a minute." Loading sand into truck in the sand pit of William VanKruiningen, Wallington, New Jersey.

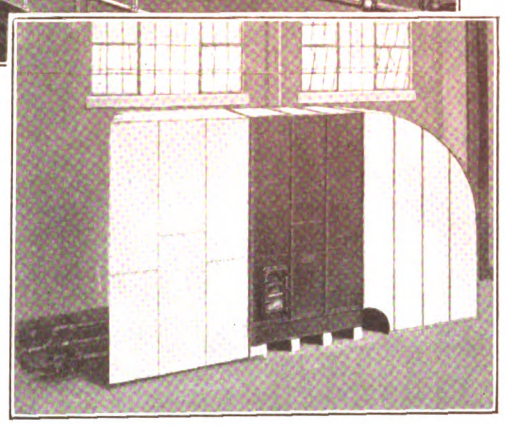
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Webster
Air Conditioning Apparatus



Interior View of Generator Room, Municipal Power Plant Jacksonville, Fla.

5 Turbo-Generators provided with Cool, Clean Air through Webster Apparatus

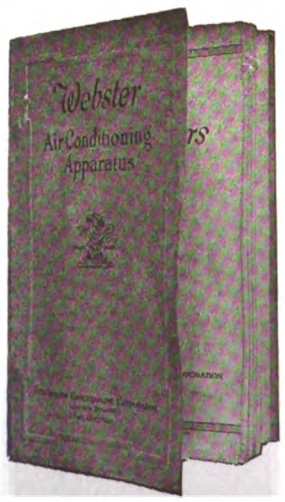


Side Elevation of 50,000 c. f. m Webster Apparatus installed in the Municipal Power Plant.

For the Proper Functioning of Power Plant Machinery

Atmospheric Control of the air delivered to generators, trans formers and other electrical power units is an important factor in the modern power plant.

If the air used is not free of dust, dirt and other foreign material, the safe operating temperature is soon exceeded. In addition, the accumulation of dirt means the rapid deterioration of windings and coils.



Frequent cleanings and costly shut-downs are the result—Figured in dollars and cents the loss is enormous.

To insure a steady supply of cool, clean, thoroughly washed air, absolutely free of any particles of dust, the Municipal Power Plant at Jacksonville, Florida have installed Webster Air Conditioning Apparatus known as Generator Coolers.

This is one of the many types of Webster Air Conditioning Apparatus which Humidifies the Air without allowing the passage of free moisture —a special WEBSTER FEATURE.

Webster Air Washers and Air Conditioning Apparatus with the Webster System of Automatic Humidity Control are adaptable to practically every type of industry.

Our engineering staff is at your service in working out your particular problem.

Send for Descriptive Literature.

Atmospheric Conditioning Corporation

469 Chestnut Street PHILADELPHIA

First Attempts to Use Power

(Continued from Page 9)

pipe into the fire by resting his weight upon one bellows, while with a cord he pulled up the other to fill it with air. It is thought that rude valves were made use of in these bellows, but the question is not yet decided.

Whether the Egyptians employed the lever, rollers, and pulley is doubtful, but they were known at least to the Assyrians, for their bas-reliefs of the 9th Century B. C. depict levers and rollers being employed in moving statues, and pulleys used for raising buckets of water.

In the Graeco-Roman period, the whole civilization rested upon slave labor. The slaves did most of the work now done through power, and the first important machines of that time were converters to make use of such slave labor. One of these was the windlass, and a still more interesting one, also employed in building and engineering, was the treadwheel derrick. By this the power was furnished by slaves treading the inside of the circumference of a large wheel. A similar wheel was employed for raising water, and the device helped to make possible much of the engineering work of the Romans.

Other important machines were developed for war. An idea of how powerful they were may be obtained from the descriptions by Polybius and Plutarch of those invented by Archimedes, and used in the defense of Syracuse (212 B. C.).

In his first demonstration for Hiero, Archimedes arranged his machinery so that one man could pull a ship up to the shore. One of the most striking machines employed in the siege, lifted a ship bodily out of the water, and then dropped it so that it plunged, with all on board into the depths of the sea.

Galen, the physician, also states that Archimedes used mirrors to set on fire the attacking ships of the Athenians. If this is true, it was a new and most remarkable use of power from the sun.

Another machine which is credited to Archimedes, was the screw called by his name. This was of great importance for raising a large amount of water a few feet.

Theoretically the most novel attempts to use new sources of power at that period, were experimented by philosophers. Some of these are described and pictured in the works of Hero, of Alexandria. There is a dispute about his date, but he probably lived in the 2nd Century B. C. In these experiments he made use of hot air, steam, and wind as prime movers. In one case the hot air from the fire on an altar was carried through small tubes and made to turn a table on which were dancing figures. The hot air from an altar was also employed through its expansion to force water from one vessel to another, the increasing weight of the latter being applied to swing open the doors of the temple.

The power of steam was illustrated by means of a hollow sphere from which the steam escaped by curved tubes. This might be considered a form of steam turbine, and is of genuine scientific importance.

In his works is also a rather good description of a windwheel which was adapted to playing an organ. Inasmuch as one practical use had already been found for the windwheel, it is surprising that nothing further seems to have been done toward its development until early in the Middle Ages.

It is indeed a rather sad aspect of all of these inventions, that they remained scientific toys when it seems as if they might have been developed for the benefit of mankind long before they were.

Highly important practical improvements, however, did take place in milling. As early as about 225 B. C. Plautus, one of the earliest and greatest Roman comedy writers, makes what is taken as an allusion to the ass-turned mill. This consisted of a hollow stone shaped like an hour glass, which was set over a cone-like base. To the hollow stone was fastened an arm and yoke, by which it was turned by the ass. This was the chief type of mill used to grind the great quantity of grain required by the people of

(Continued on Page 34)

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USER REPORT SERIES

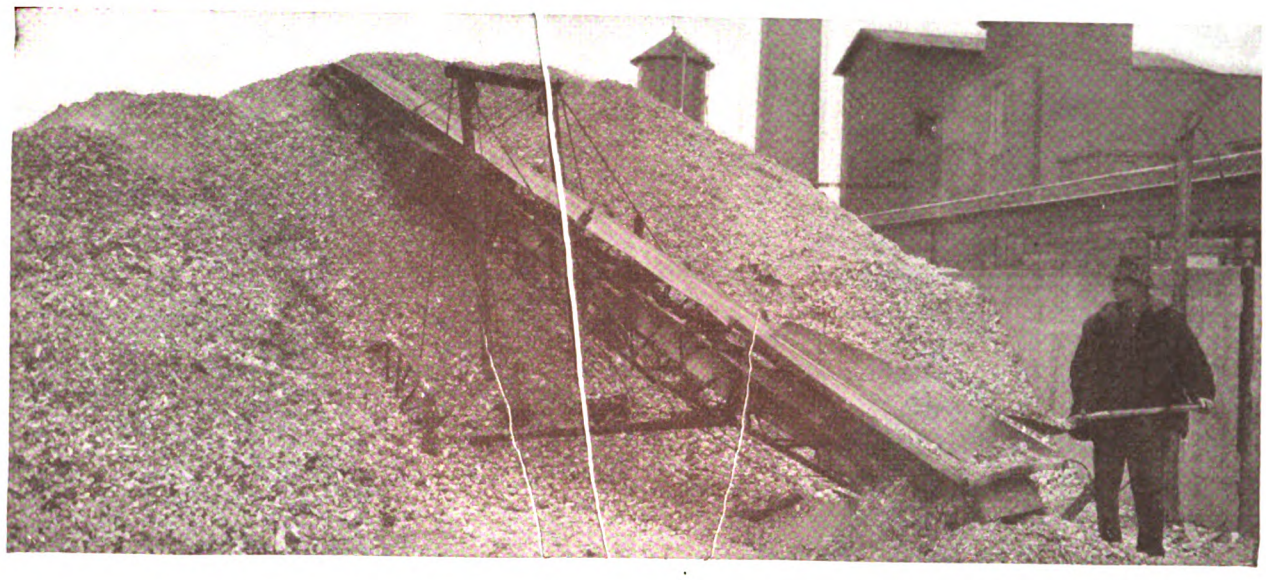
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Written by Users of B-G Machines Audited by H. P. Gould Co.

No part of this report written, altered or even seen by Barber-Greene.

Finished report as quoted here is only report which was delivered to us.

Cuts Handling Costs In Half
Working Conveyor Only 15 Hours Weekly



Mr. S. N. Wentworth, superintendent of the American Glue Co., Indianapolis, is using a Barber-Greene Conveyor for handling steamed bone and coal. Here is part of what he says about the performance of the conveyor at his plant:

"Though it *averages only 15 hours per week* in storing steamed bone, *our B-G Conveyor will pay for itself in two years* in this work alone. It stores steamed bone at a cost of $.1304 per ton, which is a *saving of $.1446 per ton over the old hand method.* It also cuts in half the time required to load this bone into motor trucks, and effects a similar saving in handling coal into and out of emergency storage. We have *not spent a cent for repairs on the machine,* although it is used roughly, given practically no care, and subjected to difficult conditions.

"Our plant produces 18 tons of steamed bone 3 times a week. This material is hauled from the digesters by motor trucks and dumped in our storage yard until shipped away.

"Formerly, this material was piled by hand, when it often required 4 men working in tiers to make a high pile. Using the B-G Conveyor, it now takes us only 5 hours 3 times a week to store the bone with one operator.

The loads of the motor trucks are dumped on the end of the machine, and the conveyor does the rest easily piling 20 to 25 feet high.

"Normally we do not keep a very large amount of coal on hand; but *whenever there is any doubt as to the regularity of supply we use the conveyor to store* from 300 to 600 tons in the yard.

"It is difficult to imagine worse conditions for a machine to work under than those to which our B-G Conveyor is subjected. The machine is left outside the year 'round. The steamed bone comes from the digesters wet, and carries more or less acid. The motor trucks dump an entire load of bone on the end of the conveyor, completely burying it, but the conveyor always quickly digs itself out."

Barber-Greene Company

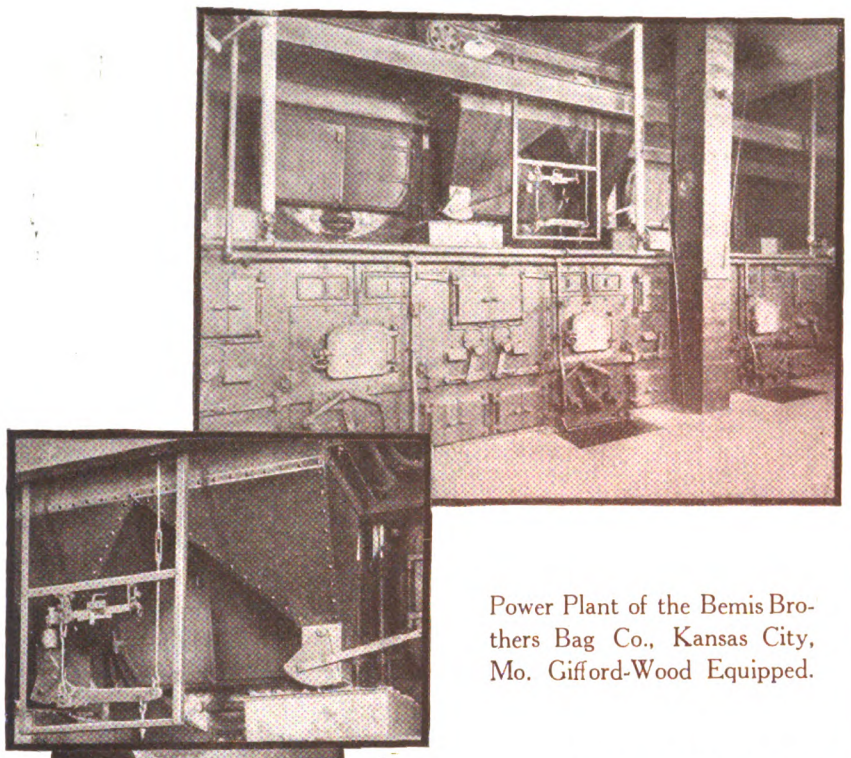
470 W. Park Avenue, Aurora, Illinois

Branches in most Principal Cities

Note **—We have literally thousands of photographs showing every possible application of our flexible standardized, portable conveyors and loaders. Tell us your handling problem and we will send an illustration of a similar installation. Or if desired, one of our engineers will call. No obligation. Our aim is to reduce your handling costs.**

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Factories Where Fuel Facts are KNOWN



Power Plant of the Bemis Brothers Bag Co., Kansas City, Mo. Gifford-Wood Equipped.

Where each lot of fuel is analyzed, where every pound of coal is weighed, where operating costs are calculated to the fraction of a cent—there Gifford-Wood coal handling equipment is used because of its low cost over long periods of use.

Every Gifford-Wood installation is designed and built to meet the same exacting requirements, just as though it were to be subjected to the most rigorous and critical test. G-W efficiency is there—you can depend upon it. G-W equipment is built stronger, lasts longer. The proof is shown in factories where fuel facts are known.

BUILT STRONGER LASTS LONGER

G-W PRODUCTS

The Gifford-Wood Company specializes in elevating and conveying machinery for all lines of industry. These products include coal crushers, pockets (wood, steel, concrete; rectangular, silo), screens, elevators, conveyors, hoppers, locomotive coaling stations, elevating and conveying equipment for ashes, stone, sand, gravel; wagon loaders, portable belt conveyors, pivoted bucket carriers, warehouse conveyors, car unloaders, friction clutches, hoists.

108 YEARS OF PROGRESS

Main Office: 7 Second Hill, Hudson, N. Y.
Branches: New York, Chicago, Boston, Buffalo

Gifford-Wood Co.

MATERIAL HANDLING EQUIPMENT

2035-R

(Continued from Page 32)

Rome and of the other large cities of the Empire.

But in the beginning of the 1st Century A. D., we find notice of an entirely new source of power applied to milling. This was the waterwheel. Possibly the first record of this is in some rather pretty verses by Antipater of Thessalonica, that were written about 85 B. C. The stanza is as follows: "Ye maidens whose task is to grind the grain, cease your labor. Sleep and let the song of the birds alone usher in the dawn. Ceres has set the water nymphs to do your task. Obediently they hurl themselves upon the wheel, force round the axle, and turn the heavy mill."

The watermill did not appear in Rome until just before the reign of Augustus. At that time, and in fact for centuries afterwards, they were placed on the open aqueducts which conducted water into the city.

Though the improvement of watermills, for several centuries, was very slow, we find them able to compete with the ass and slave driven mills in the 4th Century A. D. At about that time they were also applied to sawing marble. Their adoption was more or less parallel to the gradual decline of the slave system. Indeed, one may go further, and say that it was the development of power that made possible the abolition of slavery.

Power Plant Transportation

(Continued from Page 14)

proportionate returns. And so the attention of engineers and operators was focused on other phases of power plant operation. Instead of taking the laborer and the worker and the shovel for granted, as had been done before, engineers began to question the right of that hand method to survive—began to question it, just as they question today every existing process to make it justify its fitness. And they found some very surprising things, just as one always finds very surprising things when he begins to question things that other people have taken for granted for many years. They found that the cost of making steam did not depend wholly upon the boiler but that a very large element of this cost depended upon things that were outside of the boiler altogether. They found that machinery such as you see pictured here, which represents best practice in some of America's best power plants today, would make such savings in fuel and labor that it was not so much a question as to whether it would pay to instal this machinery and equipment, but rather a question of whether one could afford not to.

Aside from these differences in the physical appearance—in the equipment itself—between the boiler plant of twenty years ago and that of today, there are other differences too some of them visible and others invisible. One of the very visible differences is that of cleanliness. The old boiler plant was not by any means a thing of beauty nor a joy forever. The modern boiler plant is as clean as a whistle. One could almost eat one's dinner without reluctancy if it were upon the clean concrete floor. Coal dust and smoke no longer make the fireman's life a foretaste of a future inferno. Even the air in a modern boiler room (as we shall see in a later issue of Industry Illustrated) is frequently cooled by air-conditioning apparatus, to make it conducive to comfort and best performance of both men and machinery.

Light, too, and particularly natural light, is the feature in a modern boiler plant. There are installations of course in cities where the boiler room must be underground and where this operating convenience of natural lighting cannot apply. But in the isolated plant you will find the same attention given to lighting the boiler room as is given to lighting the production departments in the factory. It pays too, for the boiler room is a great production department, containing the most costly investment in equipment, and equipment does not depreciate so fast in the light as it does in the dark, because one can see readily what

(Continued on Page 36)

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ECONOMY ~ the Watchword

DURING the remainder of this year of 1922—and probably for a number of years to come—*economy* must be the watchword of every industrial organization. Our available energy of money, man-hours and power must be made to count effectively—wastes must be eliminated—a profit must be had if we are to survive, and had *largely* from what we have wasted or thrown away in the past. Indeed this economy is so vitally necessary that it is safe to say that those firms that do not now make it their primary policy will find the ones that do so taking the bulk of the business and all of the profits away from them. And this spirit of economy ***must pervade the ranks***—it cannot be superimposed by the management, nor fully obtained through the individual effort of department managers—disciplinary measures and disciplinary channels, in other words, are not suitable nor sufficient for developing it successfully. To develop its full possibilities, it must be an individual plant ***economy morale***, systematically created and inspired instead of being merely superimposed.

from article on "Economy Morale in Readjustment" by John H. Van Deventer, in **Industrial Management**, April, 1922.

"Plant Economy Morale" through Foremen Training

INDUSTRIAL executives everywhere realize that the life of their business depends on every man doing his share towards the elimination of waste, increased production, and reduced costs.

The great difficulty is to get the idea across to the rank and file—to the men at the lathe and the bench—to the fellows in the yard and the power plant—in fact to every worker on your payroll.

And these men can be reached only through the foremen. They are directly in touch with the workers—they are the men on the job.

The foremen are not unwilling to effect these savings! They gladly co-operate with the management when they are shown the way. They need only the proper training to stimulate them to constructive thinking and in turn inspire the men towards greater co-operation.

The Business Training Corporation through a practical plan of Foremen Training has helped in the elimination of industrial wastes in over 500 plants, representing almost every type of industry. There is nothing theoretical about the plan. Its results have been demonstrated. It is thoroughly practical and commands the enthusiastic interest of foremen and other key men in industrial plants.

Write for our brief report "Making Better Foremen." It shows how other companies have prepared themselves for 1922 and for a number of years to come. The report is a record of facts which no wide-awake executive can afford to overlook. It will be sent on your request without obligation.

Business Training Corporation

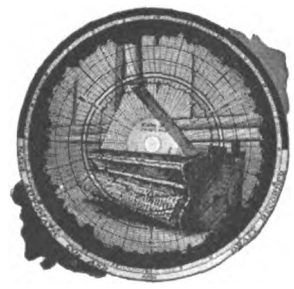
"Greater Team Work Through Group Training."

185 Madison Avenue *New York City*

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Whether Hand Fired
or Stoker Fired

You can see thru the Hays Chart





What is happening in the Boiler Room

With coal so expensive and hard to get and with freight rates so staggering it behooves every user to consume less by burning it efficiently.

To enable you to burn your fuel efficiently you must know at all times what you are doing and the reason. A daily chart from

The Hays Automatic CO_2 and Draft Recorder gives you this information more accurately, and more promptly than does any other instrument.

A single Hays Recorder has made it possible for The City of Moorehead, Minn., to cut fuel bills 15% and save from 15 to 30 tons of coal every month. Capitol Elevator Co. at Duluth report savings of 19%. Ft. Scott Public Utilities reduced their oil bill 14%. Plants all over the country are being guided to economy by Hays Automatic Co_2 and Draft Recorders and "Hays Service."

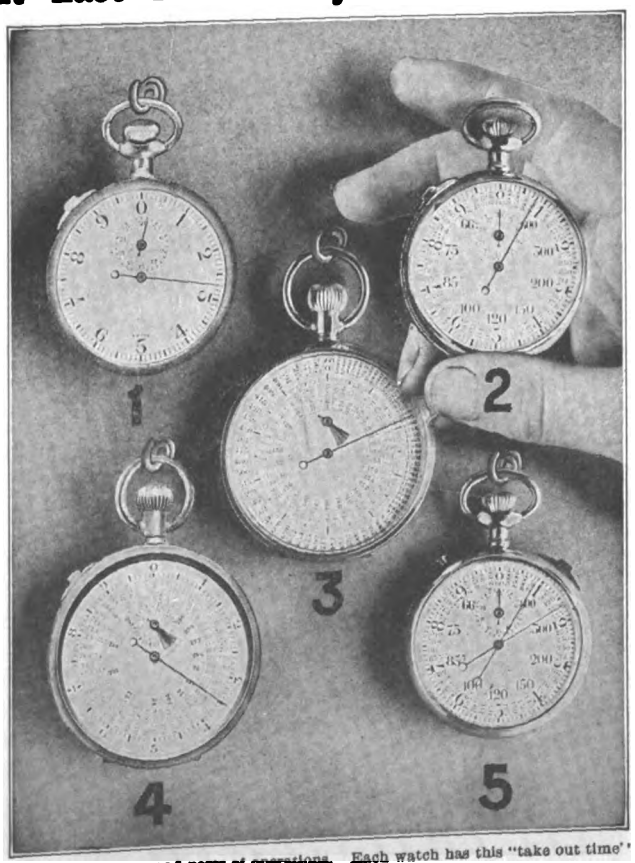


Literature for the Asking

The Jos. W. Hays Corporation
Combustion Efficiency Appliances

1038 E. 8th Street, Michigan City, Indiana

At Last Time Study Watches for Every Job



At last time study watches have been developed to where they can apply to every job in the plant—do their own calculating for production figures—give you direct results with absolute accuracy. Your job may be a simple time analysis—or a complex problem in piece work rate setting or a bonus system—there's a watch in this illustration that exactly fits your needs.

For Locating Wastes
Computing Costs
Setting Rates for Piece Work
Establishing Bonus Plans

You can use any one of these watches for every kind of time study. But each has special features that facilitate certain types of work. No. 1 has a plain decimal dial with the "take out time" feature. No. 2 has, in addition, direct readings in production per hour up to 1 minute jobs. No. 3 carries the same readings up to 5 minute jobs, in seconds and half-seconds. No. 4 gives all readings in decimals and shows production figures up to 3 minute jobs with a special arrangement for timing jobs up to 30 minutes. No. 5 is the "split hand" watch with the "take out time" improvement which now permits careful studies of multiple operations and parts of operations. Each watch has this "take out time" feature.

Any Watch Sent on Approval to Responsible Concerns

Pick the watch that fits your job. We will gladly send it with a descriptive pamphlet on its use to any responsible concern on approval. Put it to any test you wish—prove its advantages in facilitating the work and guaranteeing absolute accuracy. Each watch is backed by our unlimited guarantee. Write us today for the instrument that fits your requirements—or in case you desire our advice, tell us the class of work you are doing and we will ship you the watch to meet your needs. No obligation. Write today for detailed pamphlets, or for pamphlet entitled "More Jobs for the Factory Stop Watch."

MORTIMER J. SILBERBERG CO.

Peoples Gas Bldg. — Pioneers in Manufacture and Sale of Time Study Watches — Chicago, Illinois

(Continued from Page 34)

is happening to it when there is plenty of light provided.

One of the biggest differences between the boiler room of twenty years ago and that of today is an invisible difference. It is the attitude of the management toward the power plant as a whole. *Then* it was considered aside from the factory, not a part of it. Management, so-called, did not in those days extend its interest into the power plant. It was left to Bill, the engineer, to produce results that were satisfactory to himself so long as he kept the wheels turning. Today, the power plant is regarded by modern executives as a production department, one of the most important in the plant. It is run on a business basis. It is not enough to keep the plant moving, but it must be kept moving at a minimum cost, and its cost of operation must be comparable with that of other plants recognized as the best.

In fact this invisible change, this change in executive viewpoint, has been one of the largest reasons why one finds so much of this engineering equipment in a modern power plant, for the executive will invest where he can see a profit.

Industrial Relations in the California Petroleum Industry

(Continued from Page 24

The real point at issue, however, was the determination of the labor leaders to force the operators to continue an agreement, which, if applied generally and continuously, would mean the ultimate nationalization of the oil industry. The operators refused to continue the agreement, not because they wished to take advantage of their workers but because they believed it wrong in principle. It placed the responsibility for decision of employment questions upon men who were neither of the employees nor of the management, and who did not bear the consequences of their decisions.

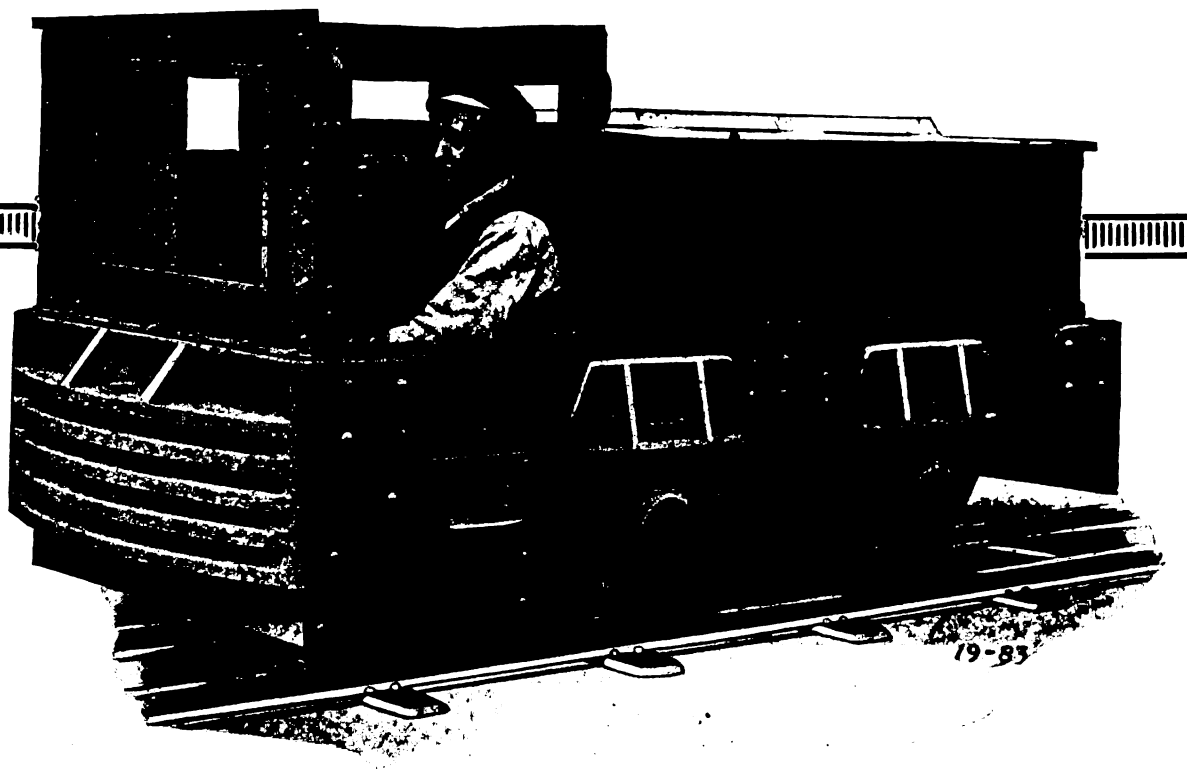
For weeks a lawless condition existed in the California oil fields. The highways were guarded by armed strikers, vehicles were stopped, the occupants questioned, and allowed to proceed only by permission of the guards. By rare good fortune, in view of the number of irresponsible armed men involved, the strike ended with comparatively little property damage and no fatalities.

After approximately two months, the United States Department of Labor was instrumental in bringing about a vote by the Union to return to work and operations were quickly resumed. Naturally there was a change in the policy of the operators which was most clearly seen in the tendency to reduce the force and to carefully scrutinize the record and intentions of each man reemployed. The Associated Oil Company appointed committees of its faithful employees who passed upon all applications of strikers for reinstatement. The names of many Union men were replaced on the pay rolls, but in each case it was made clear that the man realized his responsibility to his state government, to his family, and to his contractual obligations as superior to his responsibility to any organization of workmen. No objection was made by the operators to full and frank discussion and man to man consideration between themselves and their employees, either as individuals or through committees. The end of the strike gave assurance that there would be no intrusion of a irresponsible third party in such negotiations. Operations are now progressing normally with the same amount of work accomplished with a greatly reduced working force.

The Industrial Relations Department in the Pacific, Associated, and Amalgamated Companies, had been in existence about one year prior to the strike described above. Although fairly satisfactory progress had been made, we were nevertheless handicapped by existing conditions and were unable to do many of the things which we desired to accomplish until the decks

(Continued on Page 38)

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A Powerful Compact Little Machine

RAPID–RUGGED–RELIABLE

HUNT
STORAGE BATTERY LOCOMOTIVE

For Industrial and Mine Service

Any track gage from 18" to 36", minimum curve radius 10 ft.

Rated draw bar pull—800 lbs. at 4 miles per hour—steel wheels slip at 1600 lbs.—starting pull. Speed up to 10 miles an hour.

Operator protected by sliding top on cab.

Battery capacity ample for full day's work—Battery box easily removable for extra set of cells for 24 hours service.

Our engineers are prepared to submit interesting figures on your haulage problem.

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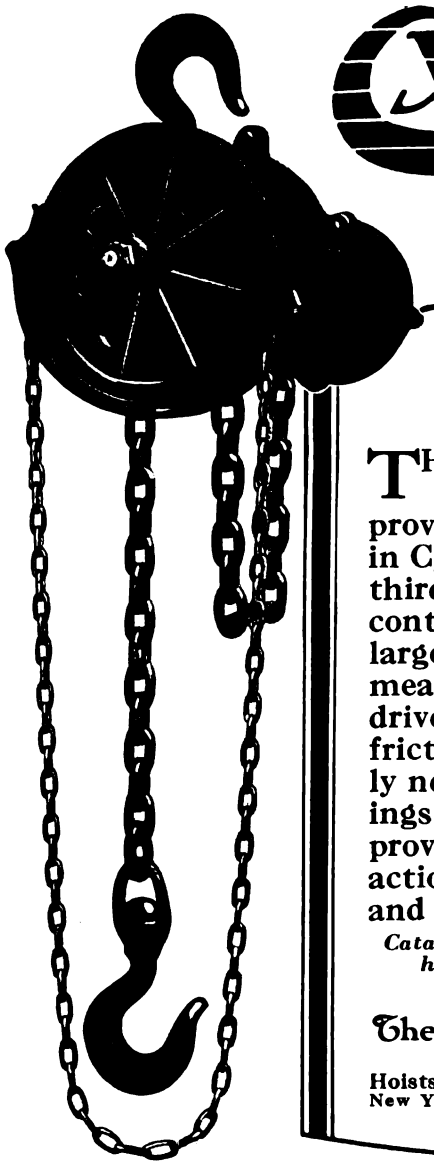
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CYCLONE
HIGH SPEED
HOISTS

More Lift per Pound Pull!

THE gyrating yoke, a patented mechanical improvement found exclusively in Cyclone Hoists, keeps two-thirds of its teeth in constant contact with the teeth of the large load chain gear. That means a surer, more powerful drive with remarkably low frictional losses and practically no vibration. Roller Bearings (another C. M. Hoist improvement) insures smooth action, a faster, easier lift, and *longer life!*

Catalog completely descriptive of our hoists, cranes and trolleys will be mailed on your request.

The Chisholm-Moore Mfg. Co.
Cleveland, O.

Hoists --- Cranes --- Trolleys
New York Cleveland Chicago

(Continued from Page 36)

were cleared by the settlement of the strike.

This department represents the first effort in California to apply centralized industrial relations work to the production fields as well as to transportation, refining, sales and offices. Our staff includes eight employment foremen who maintain local records for their divisions and make monthly reports covering their activities which include employment, inspection of sanitation and housing, safety first, encouragement of social activities and athletics, and other matters in which the Department may be interested.

All of these employment foremen are directly responsible to the local superintendent or agent and occupy the same position in the organization as any production foreman or bureau head. The Manager of Industrial Relations assists them by training them for their work, outlining general policies and methods, and visiting them periodically to assist in special undertakings. All of these men were selected from the existing organization of the Companies in which they are working and the majority of them have had many years experience in the petroleum industry.

In smaller divisions where it is not necessary to maintain a full time employment foreman, the local representative of the Department carries on certain other duties. He usually acts as paymaster and in some cases he assists with general clerical work in the office, or has special duties in the production fields. One of the employment foremen on a small division is also the resident engineer in charge of new development, and draws all plans for local sanitation, housing, and similar projects.

With small divisions widely scattered it is impossible to do more than merely develop within the organization a co-operative attitude toward the desired standards governing personnel matters. We have found it advisable to work through the local executives, preferring to encourage them in better practices and to a close adherence to labor policies outlined by the management, rather than attempt to handle the details through any central office. In this way we have built a much stronger organization, because each man who is helped to solve his own difficulties becomes a better executive. He is very much more valuable to the Company through having found his own way out of his troubles with our occasional assistance than he would have been had we solved them for him.

DIVISION	No. Times Worked	No. of Hours	Cost	% of Pay Roll
A	12	70	54	0.07
B	760	2043	1772	0.4
C	186	418	338	0.5
D	398	816	678	0.6
E	403	1261	1117	0.9
F	1870	4132	3273	1.0
G	579	1877	1561	1.06
Total	4208	10617	8973	0.7

METHOD OF REPORTING OVERTIME

Part of a system of periodical reports issued by the Industrial Relations Department

A system of monthly reports covering the more important activities of the department keeps all executives in touch with our program. The report includes comment on conditions in each division as well as statistics covering labor turnover, absenteeism, accidents, housing, etc.

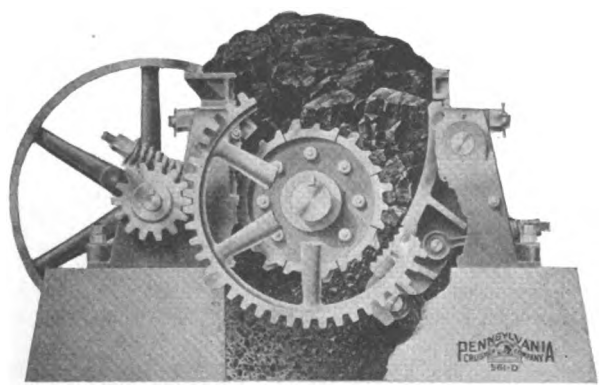
One or two examples will serve to illustrate how the Department functions.

The Associated Oil Company has a typical Safety First program, one of the first undertaken by any of the western companies engaged in oil production. The Safety organization is headed by the Safety Board, consisting of Department Heads whose duties naturally bring them in contact with these problems.

In each of the operating divisions of the Company, both

(Continued on Page 40)

"PENNSYLVANIA"
COAL PREPARATION MACHINERY



THE return of competitive markets,—buyers' greater knowledge of coal values, and the general use of automatic stokers, are all factors which point to the imperative need for accurate, efficient coal preparation, by both producers and users.

The "Pennsylvania" Line includes three distinct types of coal crushing and cleaning machinery, specialized for preparing all kinds of bituminous coal at Mines, Washeries, Central Stations, Coke Works, Coke Plants, Gas Works, and Industrial Plants generally.

Two of these types automatically eliminate Tramp Iron, and the third is thoroughly protected against damage from it.

Experience with varied coal preparation problems has fitted our engineers to give you practical co-operation.

"Stock Shipments on Smaller and Medium Sizes."

PENNSYLVANIA CRUSHER COMPANY

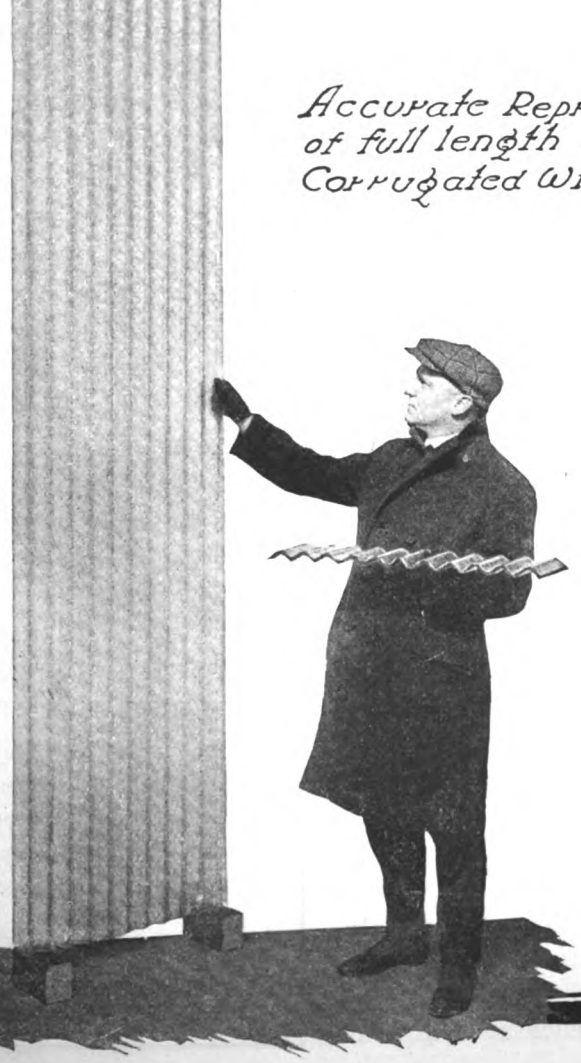
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Roofs
Skylights
Side Walls
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Canopies





Accurate Reproduction of full length sheet of Corrugated Wire Glass.

DAYLIGHT *is* Power! And power, thru maximum daylight and efficient contented workmen, is the achievement of Pennsylvania CORRUGATED WIRE GLASS.

This glass (C. W. G.) has solved many varied problems for firms of such scope as The American Tobacco Co., Vacuum Oil Co., McClintic Marshall, who have used it for roofs, skylights, side-walls, etc.

A few excerpts from users' letters show the diversity of this product's advantages:

"Since putting in this glass, have not had much use for electric lights during the day".

"Proper light is furnished without the direct rays of the sun."

"No leakage during our rainy season, as we have where plain window sash is installed."

"Very satisfactory owing to its ability to withstand expansion and contraction."

"Workmen are able to do more work."

Perhaps C. W. G. can help you. Engineering advice free.

Frankly, we would like to tell you more, but we have a limited budget; consequently, as we change mediums frequently, THIS ADVERTISEMENT MAY NOT APPEAR AGAIN.

Therefore, *send for our catalog*—it gives details and engineering data.

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711 Pennsylvania Building,
PHILADELPHIA.

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It's Time to "Pick Up The Pilot"

A problem for the President, General Manager, Director, Secretary or Treasurer.

Each business today is headed for a new port.

Methods of production planning, of accounting, and most emphatically of cost determination, perhaps efficient in other days, have now become an inadequate *collection of habits—rut-running habits.*

Can your decisions and policies in meeting present conditions, then, be other than fettered by such habits—these "ghosts of yesterday"?

The solution lies not in revolution, but in evolution; through a fresh point of view and the application of sound economic principles.

It's time to "pick up the pilot."

Our bulletin, "Straight Talk," an exceedingly informal two minute chat on management problems, will assist executives who have ambitions to satisfy. Your request on your letterhead will bring a complimentary copy.

McCALL BROWNELL & COMPANY, INC.

Industrial, Organization, Cost and Sales Engineers.

Aeolian Building **New York**

(Continued from Page 38)

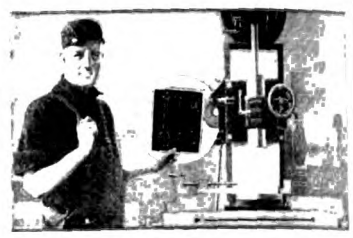
in the producing fields and in the refineries, there are safety committees which represent workmen, foremen and engineers. Meetings are attended by the local superintendent and the employment foreman acts as secretary of the committee.

The Central Safety Board functions both as a supervisory and as an executive body. It originates plans, and also passes upon suggestions made by superintendents or committees. As far as possible, all suggestions in each division are handled by the superintendent or manager in charge of the division. Only matters involving Company policy or the adoption of a general practice in all of the Departments are considered by the Safety Board.

The records kept by the employment foremen regarding accidents, and compiled in the San Francisco office of the Industrial Relations Department, show the causes for accidents and the number occurring in each division. They also show the number of accidents occurring according to occupations, the amount of time lost by employees, the cost to the Company, the cost of injuries to employees, and the age and length of service of employees who are injured. The severity rates and frequency rates are calculated monthly for each division according to the standards set by the National Safety Council. This information, collected monthly, has given us a basis for comparison of divisions as well as a starting point for educational work and the installation of safeguards.

The most important single fact established by this statistical data is that the majority of accidents are the result of carelessness or inattention and cannot be prevented by the use of safeguards. Our most effective efforts, therefore, have been directed through educational channels. Evening mass meetings are held at least once each year which are attended by employees and their families. The general subject of safety and sanitation is presented at these meetings, not only by addresses, but also by motion pictures.

An especially successful means of reaching our em-



His SAFEGUARD—

A PHOTOSTAT Print

Even your most conscientious machinist doesn't have to "make sure" about any figures or lines on a PHOTOSTAT print. He knows that the print was made directly from the original drawing, not from a tracing, and

The PHOTOSTAT Makes No Mistakes

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There is always the possibility of errors in blueprints made from tracings. PHOTOSTAT prints are absolutely accurate.

It takes hours and in some cases even days to make tracings and blueprints. PHOTOSTAT prints are produced in a few minutes. Tracing takes a skilled draftsman. The operation of a PHOTSTAT requires only a boy or girl.

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ployees has been through bulletin boards installed on all of our properties. Mimeographed articles on safety subjects, prepared as the result of investigations of our own problems, are distributed to foremen, superintendents, and members of safety committees. Each division has been provided with a small library on safety and fire prevention subjects. A part of our success may be attributed to the fact that the Company is a self-insurer under the State Workmen's Compensation Act, which gives us the direct benefit of all savings realized through accident prevention.

Although the period of time over which this campaign has been conducted is not sufficiently long to enable us to publish statistics which would be very helpful to other companies, we feel justified in saying that a good many thousand dollars have been saved in comparison with our expenses of previous years. Not only has the Company realized a saving, but we also have shown a material decrease in the losses to employees. Both the number of injuries suffered and the time lost due to accidents have been appreciably diminished. With the close of 1921 the Associated and Amalgamated Oil Companies stand alone as the only large producing companies in California which reported no deaths due to industrial accidents during the year. Thus, both the workmen and the company have profited by this cooperative undertaking.

Medical examinations previous to employment are not as yet customary in the California oil fields. Only one or two companies require such examinations for office, refinery, and sales employees, and only one has a thorough physical examination for field men and pipe liners.

Only one of the large producers of California has attempted to erect field hospitals. Several hospitals are located at refineries. These are modern in every respect and fully meet the requirements for industrial medical work. The majority of the smaller companies make arrangements with local physicians to treat first aid cases and to treat serious illnesses among the men as they occur.

Accident prevention, sanitation and housing projects, and education are a few of the mediums through which we are trying to build up that spirit of mutual cooperation and loyalty which is the aim of every well defined industrial relations program. There is an equal need among executives and employees for a better understanding of these principles.

With every employee in the organization viewed as a potential executive, training for supervision becomes an important part of our program.

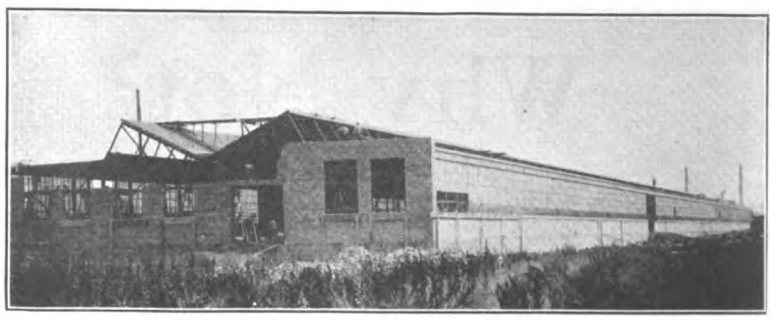
At the Associated Oil Company refinery at Avon, about fifty men, including superintendents, foremen, minor executives and a few promising workmen, enrolled last year for a twelve weeks course in production methods and foremanship. An outside agency provided six lectures and text book material. Supplementary lectures were given by our department heads and general manager on various aspects of Company organization and policies.

In the producing fields, each

DIVISION	Sickness	Accidents	Private Time	Days lost per man in average working force
A		12	206	2.2
B	201	85	456	2.5
C	143	129	437	3.8
D	353	197.5	329	5.4
E	173	157	363	5.6
F	726	549.5	2365	6.2
G	214	63	227	6.4
Total	1810	1193	4383	4.8

DAYS LOST FROM ALL CAUSES

Report covering a four months' period issued by the Industrial Relations Department. Similar reports are issued monthly. Amount of private time is large because men are employed 7 days per week.



Construction Costs
Have Reached the Bottom!

THE cost of building factory structures is at the lowest point since 1913. The increase in demand for additional manufacturing space which is already following the resumption of activities in many lines will soon produce an increase in building costs. Those who need factory space but have waited for the lowest point in building costs can profit by building during 1922.

An additional saving can be made by employing "MRBN" Engineers to plan the building for you. Write for one of the members of our firm to come and outline to you our method of handling the design of industrial buildings at minimum cost to you.

Thirty Years
MRBN
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Industrial Buildings

Build Now!

MILLS · RHINES · BELLMAN & NORDHOFF
Engineers
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35% Increase in Production and a 20% Saving in Cost

AN article in "Industrial Management" by C. B. Bartlett, Production Engineer for Geuder, Paeschke & Frey Co., Milwaukee, Wisconsin, cites the above instance.

It is an example of what was accomplished by eliminating lost motion, cutting out wastes and tightening up the production process of the business. In your own plant there are many ways of effecting savings and increasing production.

The S & E Time Study Watch will bring to the surface the wastes which are digging into your profits. It not only registers the time consumed, but automatically computes the production per hour after one operation has been performed.

"Making Time Studies Pay" by B. M. Maynard is a treatise on the value of Time Study in eliminating wastes. It will be sent free on request. Write for your copy today.

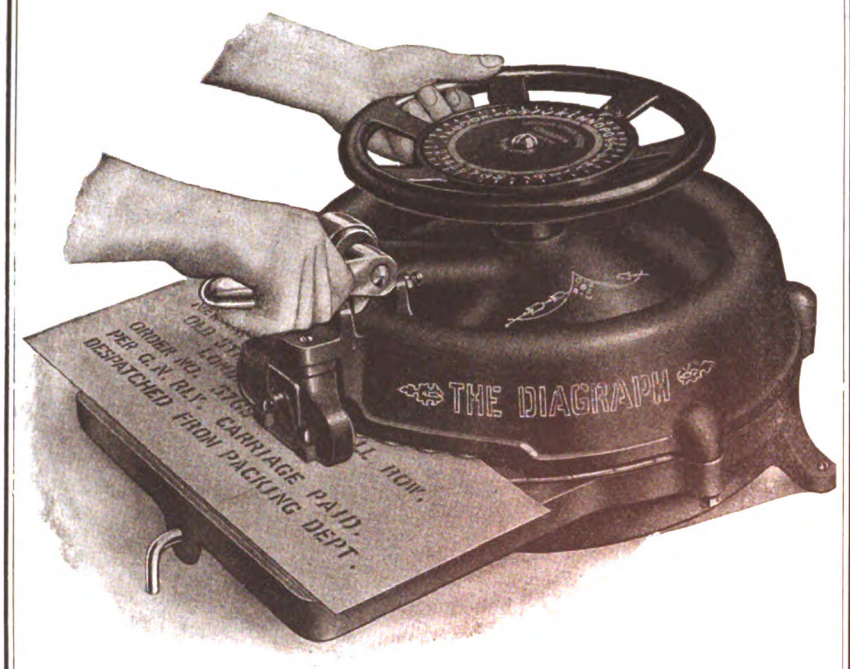
"FOR instance, the price for japanning a tin box, which was $15.00 per thousand at the beginning of 1921, with an average production of 34 pieces per hour, is now $12.00 per thousand, with an average production of 48 pieces per hour; so reducing the cost of the box per piece and yet increasing the wages per day of the operator."



Stein & Ellbogen Company
35 North State Street — Chicago, Ill.
Time Study Watches — Precision Instruments
Send for one of these watches on 30 days' free trial.

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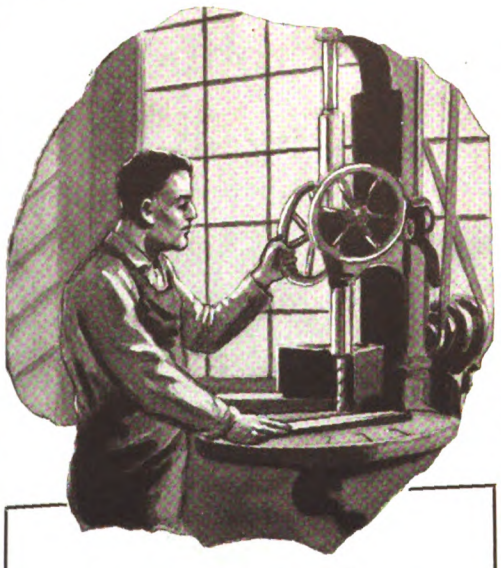


WHY NOT put your shipping department on the same money-saving basis as the rest of your business? Buy a Diagraph Stencil Cutting machine—with it you get the positive assurance that shipments leave your plant bearing clean-cut, legible addresses that protect you against your share of the million-dollar transit losses which shippers pay each year. More than 20,000 Diagraphs in use. Try one at our expense.

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Branches in all principal cities—see phone book.



BLU-EE

TRADE MARK

Cuts Out the Glare

'Glaring light is a menace to the workers and retards production. The ideal light is a soft, cool light made by the sun's rays with the glare and heat cut out.

BLU-EE keeps out the rays below the blue line in the spectrum --rays that give the heat and glare to the sunlight. Those above the blue line penetrate unhindered and the result is a diffused, filtered light, restful to the eyes and gives the worker a chance to do better work.

BLU-EE is easily applied; simply dissolve in hot water, allow to cool and apply to the windows with a paint brush. One coat lasts for months.

We want to prove what BLU-EE can do in your plant. Try some at our risk. Fill in the coupon below and send it in at once.

What BLU-EE Users Say

BLU-EE "entirely removed the glare and very appreciably reduced the amount of heat carried through the sunlight."
Mr. H. C. Marmon, President
Nordyke-Marmon Company

We have applied this material to a considerable area of our factory sash and have found it very satisfactory in reducing the glare of the summer sun, producing a cool, pleasant light inside the building.
H. H. Franklin Mfg. Co.
Syracuse, N. Y.

PARK CHEMICAL COMPANY

3822 Edwards Road Cincinnati, Ohio

Try It Out—We Run the Risk

PLEASE send me 2 packages of Blu-EE, sufficient to cover 2000 square feet of glass. It is understood that I am to use one of the packages as directed and will remit $5.00 for both if I am satisfied with Blu-EE, and if not entirely satisfied may return the other within sixty days and you will cancel this order.

Firm Name..... Position.....

Your Name..... Address.....

superintendent calls his foremen together daily to lay plans for the following day. Special meetings of field foremen are held occasionally to consider safety, employment matters, or other similar subjects.

Sales agents are required to attend monthly meetings for the discussion of current problems. Personnel questions are given a place on the program at each meeting.

The organization staff has been assisted in coordinating the efforts of various departments by a system of committee government which was inaugurated last year. Weekly meetings of department heads with the vice-president in charge of operations are supplemented by meetings of committees assigned to special work. These committees include one on sales, another on manufacturing, a third on automotive equipment, and a fourth dealing with storehouse problems and standards for the purchasing department.

In our organization we have been working on the problems of general training for employees for only a short length of time, and dislike to appear to advertise something which is in many respects still somewhat in the experimental stage. A mere outline of our plan will indicate what is being attempted.

Our training methods may be roughly defined under the following heads:

1. General educational publicity through the house organ.
2. Helping beginners to undertake their work under proper conditions with some introduction to the Company's general organization and policies.
3. Special courses for office employees.
4. General meetings, particularly of sales employees, for the purpose of discussing specific subjects of general interest, as well as for the purpose of becoming acquainted with the work of other Departments.
5. Accident prevention, through cooperation and Safety First.
6. Vocational training for our oil field workers, through co-operation with State aided vocational high school courses.
7. Training for foremen through meetings and directed reading.
8. Library service.
9. Motion picture films.
10. A training school and instruction manuals for service station attendants.

Our aim has been to discover an educational need, and then to find some practical way to meet it. The instructor in charge of our training courses for office employees and junior clerks, has found the method of individual instruction, coupled with occasional class meetings, very effective. Each student progresses with the course as rapidly as his ability warrants. Work is turned in and corrected at regular intervals. Consultation with the instructor is offered and insisted upon if the student is not making satisfactory progress.

Through the medium of our monthly employees' journal, motion picture films, and mass meetings of employees, we have tried to give everyone in the Associated Oil Company a general picture of our work. Divided, as it is, into six main divisions, comprising the producing fields, pipe lines, refineries, transportation, sales, and general offices, widely scattered through several states, it is difficult for persons in one branch to appreciate the problems of those in another division, or for those who do not have an opportunity to travel to gain a clear and comprehensive view of the managerial and financial difficulties of the entire Company.

We have been quite successful in training salesmen and service station attendants. A school station has been started for training service station attendants and educational material is being prepared and put into the hands of all such employees.

Not all of our activities are capable of measurement in the same concrete manner that accident prevention is estimated. The accomplishments of our organization through active cooperation in safety first is

(Continued on Page 44)

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THE BOARD OF DIRECTORS INSISTS

On having facts presented to them on graphic charts.

EDEXCO MECHANICAL GRAPHS

make it easy to prepare even complicated facts in graphic form, in a very few minutes. These charts are large enough to be seen across the room by every man. They are neat and clear-cut in appearance. They are not drawn on paper. Each bar is a ribbon whose length is altered at will.

In the meeting pictured above, the right hand chart is being altered to show an entire new set of data which has just been asked for. This is very quickly and easily done with an EDEXCO Mechanical Bar Chart.

The sales of each branch, types of sales or commodities sold for a period of years, Daily Sales for the past month, Production from various units—in fact, every sort of operation data can be clearly shown on these graphic charts.

In these days when conditions must be carefully watched, busy executives no longer think of trying to work with complicated tables of figures.

Our four color booklet on "EDEXCO MECHANICAL GRAPHS" will be mailed promptly on request.

We also supply charting paper, map pins, swinging leaf fixtures, books on graphics and every type of graphic record supplies. Trial outfit of the small supplies for practice purposes, sent for $1.00.

Educational Exhibition Co.,

627 Custom House Street
PROVIDENCE. R. I.

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If you have boilers —any kind,

—provide the best possible regulation of the feed water, and you will save fuel that is well worth saving;

You will get increased boiler capacity for peak loads.

These results will be accomplished in your boiler room *with less labor*—water tenders will be released for kinds of work that men can do efficiently. Even under the most favorable conditions, a man cannot regulate boiler feed water with anything like the efficiency of the Copes Regulator.

"Copes" pays for itself in a few months—sometimes in a few weeks

By saving coal, saving labor, and by increasing boiler capacity for peak loads, the Copes Regulator has often been found to pay back its entire cost *several times the first year.*

It is made for years of service—very simple mechanically. Consists of an accurate and durable control valve, which is actuated by a heavy metallic expansion tube. No floats or displacement bodies, no springs or diaphragms—no troublesome parts, no variation in results.

Automatically, and unfailingly—

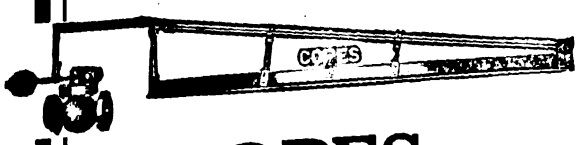
When the steam demand suddenly increases, the Copes Regulator at once *reduces* the water input so that heat stored in the boiler may be used.

When the load suddenly drops, the Copes *increases* the water input so as to store heat for the next peak.

During constant load the Copes feeds steadily and maintains the water level in the boiler between the high and low limits which have been set.

The operation of the Copes Regulator is very interestingly described in a new booklet. It contains charts which plainly show the results of improved feed water regulation. *Write for catalog K. B.*

NORTHERN EQUIPMENT CO.
101 West 11th Street
ERIE, PA.



COPES

(*Continued from Page 42*)

at least paralleled by the reduction in labor turnover Many of the production fields are located in desert areas where excessive summer heat and occasional sand storms make the location undesirable. Some of the work both in the fields and in the refinery is hard and disagreeable. In spite of this fact, the labor turnover of the permanent force in two of our companies employing about 3,600 persons is now only a little more than 3% per month. This includes kitchen help and construction and marine departments. The general offices, employing nearly 400 persons, had a labor turnover for the past three months, (December 1921, January and February, 1922,) averaging 1.8% per month.

Our outstanding need at present is for an unremitting campaign of education. This is needed not merely to prepare men and women better for their daily tasks, but to make them ready for advancement and for a wider sphere of usefulness, both for themselves and the Company. Much greater than this, is the demand for education as the basis for industrial peace. Upon examination of the personnel records in one field division it was found that 95% of the worst agitators had less than a sixth grade elementary school education. On the other hand, some of the better educated labor leaders, who by intimidation and specious promises forced our contented men into an unwelcome and fruitless strike, were as hopelessly ignorant as these illiterates of the fundamental principles governing sound corporation management or the elementary economic laws controlling the petroleum supply.

Realization of a community of purpose and ideals, and preparation of the individual to appreciate and meet his employment obligations can only be attained through education. I do not believe that there is ever serious danger of overemphasizing this function in any industrial organization, provided it is balanced by managerial justice in regulating hours, wages, and living and working conditions.

Standardization in the Office

(*Continued from Page 19*)

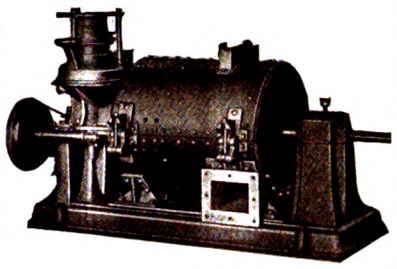
I mention this little episode to illustrate a point that is often ignored by the office manager. And that is the importance of standards in office work—for the use of the test method in the selection of equipment is simply one application of the principle of standardization. Among engineers the test principle is practically universally recognized. But they are not always able to get industrial executives to accept it. Here and there you find a factory that buys its machinery by test rather than by the dubious method of "trial." Some of the larger or more progressive industrial plants purchase their fuel, lubricating oil, other supplies, and raw material, by test. In a few places a beginning has been made in applying this method to the selection of labor.

But if the factories that buy by test are few and far between, the offices are fewer and even farther. I doubt if there are twelve offices in the entire country that consistently select their purchases on the basis of tests—and yet there is hardly a thing which is bought that would not be better bought and more economically bought if the principle of standardization were applied and rigidly adhered to.

In the present light of business the idea of economy has assumed a popularity that it did not have a few years ago. The report of the engineering societies committee on the elimination of waste from industry has done much to awaken business executives to the preventable losses. But it is worth remembering that the factory and the industrial plant are not the only places where wastes are occurring. The office in its way is just as wasteful as the workroom, and probably more so. In many concerns the production departments have been subjected to such careful programs of retrenchment or reorganization or both that they

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The Aero Unit System

of Pulverized Coal again demonstrates, as in other work of human endeavor, how an original idea at first worked out by complicated and costly methods is finally simplified and perfected until it becomes a part of our every day existence.

The Unit System reduces the equipment and therefore the cost to a minimum by placing the Aero Pulverizer at the furnace where the coal is fed to the machine undried and is exhausted therefrom directly into the furnace. There are no dryers, no storage or long lines of transportation for the powdered coal, thus eliminating the hazard of fire or explosion.

Each Aero Pulverizer is designed as a complete powdered fuel unit for one furnace. They are built in standard sizes ranging from 600 lbs. to 5000 lbs. of coal per hour.

Bulletin Sent on Request

AERO PULVERIZER COMPANY

165 Broadway
New York

offer little opportunity for additional cuts or revision, and in a great many cases the office is the only place left for further economizing.

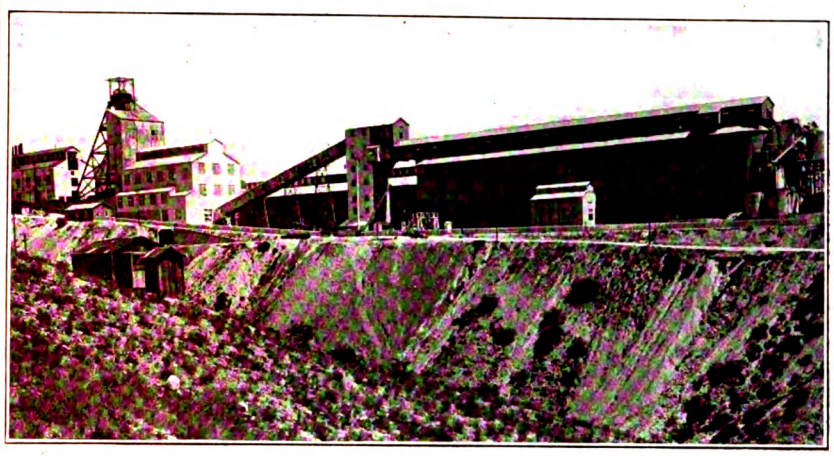
There is a factory in Buffalo famous for its excellence of production and high efficiency of manufacturing processes. Standardization has been applied in its work rooms to the *nth* degree, and with truly remarkable result. Yet recently, when it became necessary to make some changes in the offices, there was found to exist such a variety of sizes in furniture and other equipment and such a lack of logical order in the office arrangement, that by making a scientific analysis of the layout and drawing up a new pan of arrangement the company was enable to save $5000 a year on rent. It had been literally throwing away $5000 worth of space in its offices. Such a waste of raw material, or mechanical equipment, or even of space in the factory would have been discovered long ago and elminated. It would have been regarded as a serious reflection on the superintendent. Yet, $5000 in office waste is just as serious a leak as $5000 in factory waste. It eats into profits just the same.

In the average office it may be taken for granted that every function performed there, every kind of work being done, offers an opportunity to eliminate waste and get more results from the time, labor, and money expended. I know one office in Chicago, the office of a mail-order house, which doubled and trebled its output in practically every function simply by analyzing the work, standardizing it, and then training the workers in the standard method. For example, in opening general mail the standard now is 300 letters an hour (often exceeded) whereas the former average was 100 an hour; in opening advertising inquiries, 500 now, 100 formerly; in typing letters, 200 square-inches now, 100 formerly. It used to take an order all the way from three hours to three days to go through; now the average is less than an hour.

Such economies are accomplished through standardization—standardization of methods, of equipment, and of every

23 Merrick Conveyor Weightometers

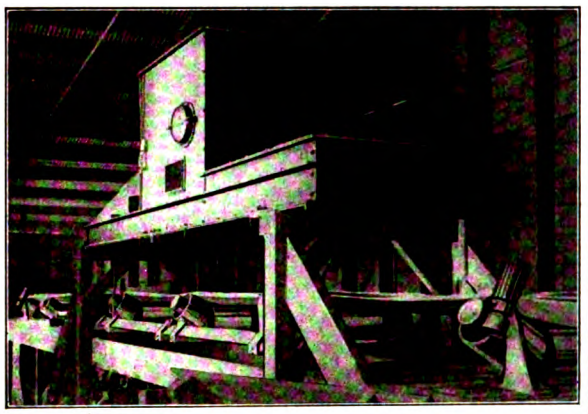
Weighing Ore while in transit over Belt Conveyor at this plant.



Inspiration Consolidated Copper Co.
Inspiration, Arizona

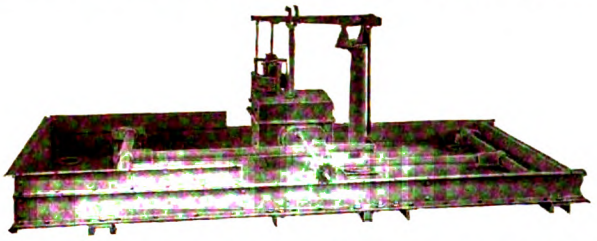
No matter what your conveyor handles whether Ores, Concentrates, Coal, Coke, Cement, Stone, etc., THE MERRICK CONVEYOR WEIGHTOMETER will meet your requirements successfully and with an accuracy demanded by engineers, and weighmasters.

No weighman or other attendant required.



Typical installation MERRICK CONVEYOR WEIGHTOMETER

GUARANTEED AND PROVEN 99% ACCURATE

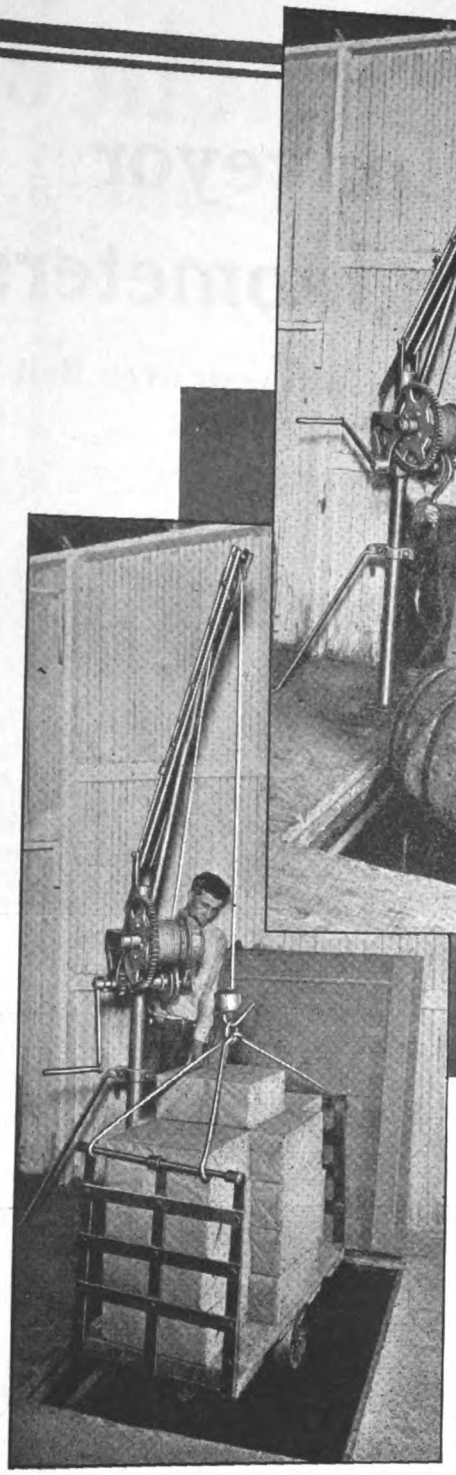


Showing the mounting of the weighing levers with connection to the weigh beam and integrator box. Casing removed.

The WEIGHTOMETER is used by hundreds of concerns for checking incoming and outgoing weights as well as for production.

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Flexibility
in Handling Factory Loads

THE Great Western Paper Box Co., St. Louis, Mo., puts its G & G Hoist to many uses in handling factory loads under 1,000 lbs. In addition to transporting floor trucks, barrels and similar loads between floors, the G & G Hoist is used in many places for quick, safe and economical removal of ashes from cellar to grade or directly from cellar to ash wagon.

Tell us what you have to lift and lower, and under what conditions, and we will recommend the proper G & G Hoist to fit the job.

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the G&G
REG. U.S. PAT. OFF.
Telescopic Hoist
with Automatic Gear Shifting Brake
Device and Silencer

other factor in office work that lends itself to the principle of reuse. Standardization calls first for careful study, investigation, and analysis—for the application of the test method.

Take the simple item of stenographic or typing work. How much work can your typist turn out? The next time you hire a typist, ask her her speed. She will probably say that she can write from 50 to 60 words a minute; and she is doubtless right, for that is not an exceptional speed. The United States civil service test require a speed of 60 words a minute.

But how many typists actually turn out 60 words a minute—or 50 words—or even half of fifty? It is my experience that the average typist produces about 100 square inches of typewritten matter per hour. A square-inch of pica typewriting is the equivalent of a line six inches long, and contains on the average ten words. One hundred square inches an hour means 1000 words. Divide 1000 by 60 and you get 16—and that is the average speed of the average typist on the job. Sixteen words per minute!

It is pure waste to permit typists who can do 50 or 60 words a minute to turn out only 16. But the typists cannot be depended on to discipline themselves, to standardize their own methods and output. Too often through lax supervision they have acquired loose habits of work and have to be reeducated in the right methods. Frequently they need some kind of incentive, such as a bonus or premium plan or a contest board, to get them to strive for high standards. Always they need fixed standards, some sort of set task. In a bank I found that forty-two stenographers did on the average five letters each per day. It was just an hour's work for each of them; the rest of the time they spent fingering papers, looking after casual clerical tasks, trying to appear busy. But it was not primarily the stenographers' fault that so much of their time was wasted. Each of them was naturally interested in holding on to the job, and it was the management's responsibility to provide sufficient work to keep them busy. Standardization here worked some interesting reforms and resulted in an appreciable saving of money.

Forty clerks and seven stenographers were employed in the offices of a large manufacturing company. The seven stenographers were secretaries to seven executives, and the secretarial duties of each consisted of writing on the average ten letters a day. That was really one one to two hours work for each of them; the rest of the time was spent in miscellaneous clerical work. In the endeavor to fix standards here a careful analysis was made of the work and the conditions. It was shown that all the stenographic work could easily be performed by one stenographer, and all the clerical work of the seven stenographers by one clerk, at a smaller salary than that paid any one of the stenographers. The waste in this case was represented by the difference between the salaries of the seven stenographers and that of the one clerk and one stenographer who were retained.

The efficiency of the average typist can easily be doubled. I know numerous offices where 200 square-inches per hour has been established as the minimum requirement, and is often exceeded by the more proficient operators. It is really a very liberal standard, and the office that permits lower output from the typists is getting less than it pays for.

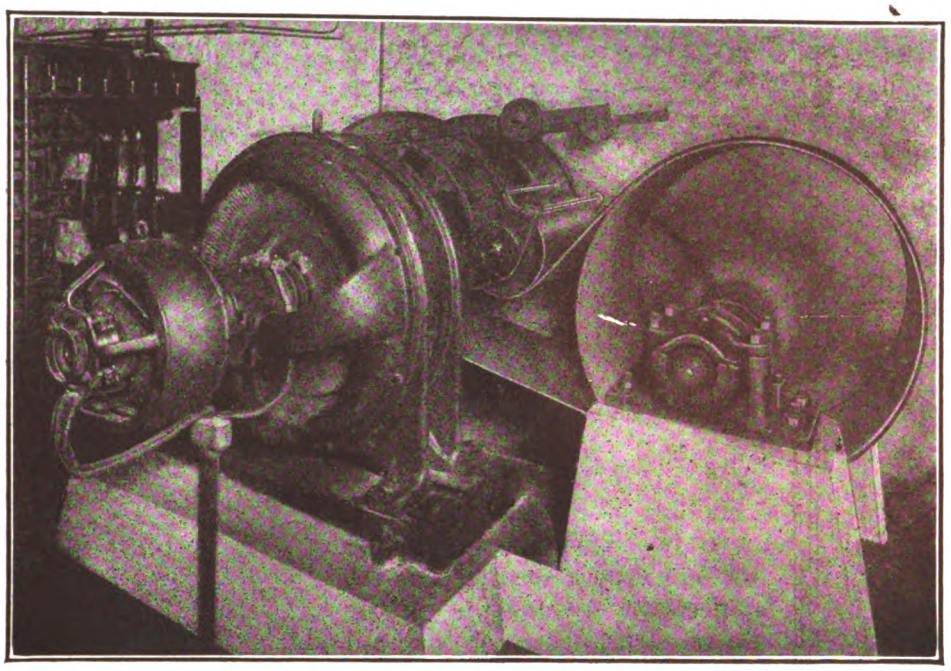
I am aware that there are operations in the office that cannot be strictly standardized. There are certain types of correspondence, for example, that cannot be scheduled and classified and anticipated. But routine correspondence can be handled fairly according to plan. The use of form paragraph systems is a familiar example of this. The nonrepetitive operations can be given some sort of system, even where form-paragraph handling may not be practicable. Methods of classifying the mail for reply in the order of importance, methods of collecting and organizing data for dictation, and other details of correspondence can be standardized. In the average office each man has his own system, or lack of system. Perhaps one energetic correspondent will have analyzed his problem and

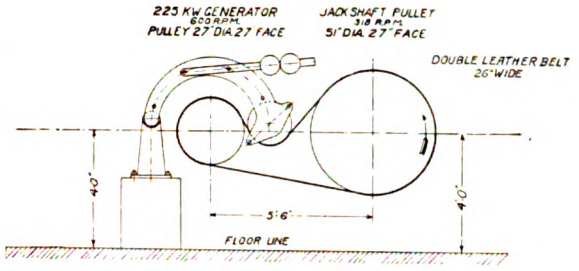
(*Continued on Page 48*)

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Transmitting 300 H.P. on 5 ft. 6 in. Centers, with a belt and a KORAP-LENIX*





225 K. V. A. Generator Drive
Driving Pulley 51" dia., 27" Face, 318 R.P.M
Driven Pulley 27" dia., 27" Face, 600 R.P.M.
Double Leather Belt 26" Wide.
Pulley Centers 5′ 6".

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The evidence is in Booklet "Saving Slippage and Space", describing Korap-Lenix installations, which will be sent on request.

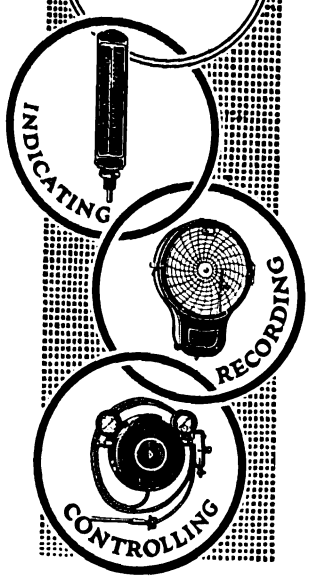
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Making a *Tycos* or *Taylor* Temperature Instrument for every purpose for home use, on the farm, in science and industry for nearly three-quarters of a century is why Taylor Instrument Companies are so universally and favorably known.

Any information you may desire with reference to specific applications in your particular industry will be given immediate attention.

Taylor Instrument Companies
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Theres a *Tycos* and *Taylor* temperature instrument for every purpose

825

(*Continued from Page 46*)

organized the one best way to care for these details. If this one best way were made standard and taught to all the correspondents, a great deal of time and money would be saved the office.

Complaints are an ever-present problem in any office having relations with customers. By the law of averages it seems inevitable that there must be some complaints. And yet, in one big mercantile office, we made a study of the complaints received and analyzed them down to their causes. On this basis we established standard methods of handling the orders and caring for other details involved in relations with customers, and the result of this standardization has been to reduce the number of complaints 42 per cent. One cause alone, responsible for 1000 complaints in a single month, was dicovered in this way, and when eliminated the complaint ceased entirely. That meant that the work of several correspondents and clerks assigned to handle these complaints was reduced —the waste was eliminated, and expense cut down accordingly.

The simple fact is that the great bulk of clerical work can be standardized. In the offices of a large publishing house in Philadelphia more than 500 office operations have been standardized. The results have been reflected in the reduction of labor costs and the improvement of output and working conditions.

Perhaps the most obvious place at which to apply the principle of standardization in the office is the floor space. It seems a perfectly simple thing to realize that helter-skelter arrangement of furniture must be wasteful of space and of energy—and yet the usual office is not scientifically arranged. The saving in rent alone that is accomplished by careful analysis of the equipment and layout and a new arrangement on the basis of standardization often runs into thousands of dollars.

For example, scientific rearrangement of offices for one concern in New York recently reduced their floor space from ten floors to eight. That reduced the rent just $30,000 a year. In another case, a concern in lower Broadway where rents are exceedingly high, rearrangement of the layout reduced the rent by $52,000 a year. An even more striking example is that of a manufacturing company which was considering building an administration building to house its overflowing offices. By standardizing the furniture and layout of the old offices this building project was rendered unnecessary, and the old offices will care for the normal growth for the next five years.

The basis of standardization of arrangement is standardized equipment. All sorts and sizes of desks are as inefficient in the office as all sorts and sizes of machines in the textile mill. Of course it is impossible to standardize on one kind of desk for all office work, for the nature of the work varies. A bookkeeper requires a different kind of desk from a stenographer. A mail clerk does not need as much desk room as a private secretary. But in general it is possible to classify the kinds of work into broad groups and to standardize on desks for each of these groups. In most cases it is possible to have desks fairly uniform in size for all clerical workers, even though the arrangement of drawers may not be uniform for all.

Most executives can get along very well with a five-foot desk. Many will find a four-foot desk ample for their needs. Stenographers and typists do very well with a single-pedestal desk, though it is not uncommon to find them supplied with the more expensive and space-wasting double-pedestal variety. It is rare that you find a clerical worker who needs a desk bigger than three and a half feet. I have found that a plain table is even better for some kinds of clerical work than a desk. In one recent instance, where we consolidated four departments into one large office, we scrapped a variety of styles and sizes of desks and provided the clerks with tables made for us by a manufacturer of kitchen tables. We painted the tables green, covered them with a linoleum top, and had a first-rate workbench for clerical operations. As these tables cost $30 less than the so-called standard office tables, and as we purchased

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one hundred and fifty of them, the saving on the equipment was $4500. Moreover, we saved 1000 square feet of space by the consolidation and standardized layout, and saved a lot of waste motion in the daily operations of the consolidated departments.

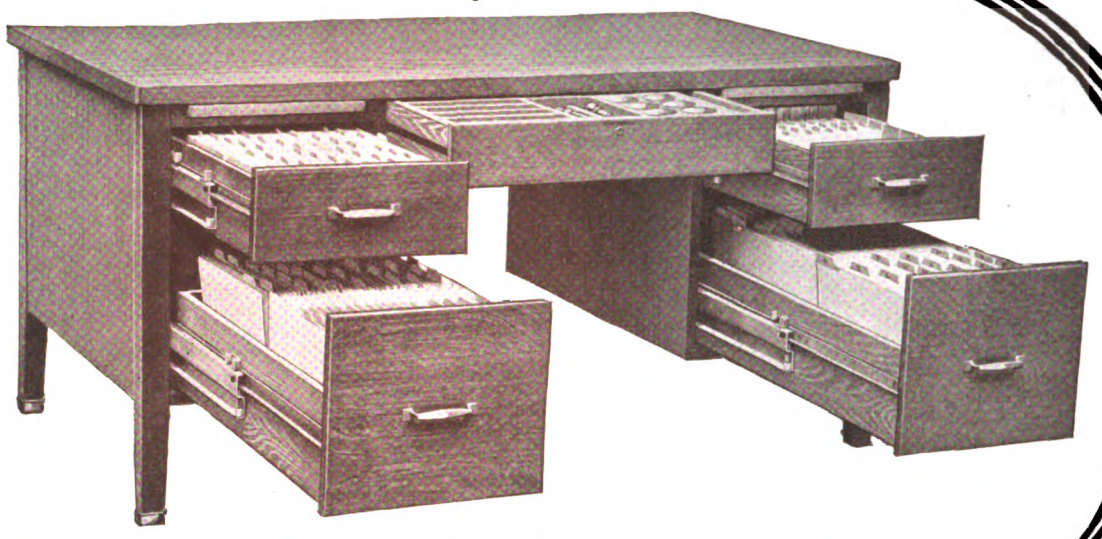
Another opportunity for economy through standardization is offered in the stationery —letterheads, envelopes, and forms of various kinds. Stationery can be standardized according to (1) size, (2) kind of paper, (3) color of paper, (4) color of ink, (5) use. Take the item of size, for example. Certain sizes can be cut to advantage out of standard sheets of paper with no waste. Also, certain sizes fit files and envelopes, and are to be preferred on this account. Consider the size of the sheet when you are ordering a job of printing and you can usually save money. Also, by combining several jobs into one, this problem of standardization is more easily solved, and again you get a lower rate from the printer because he can work big-scale more cheaply than he can small-scale.

The same considerations apply to the grade of paper used. I have seen forms used for penciled memorandums printed on high-grade bond paper and contrariwise a cheap grade of cardboard used for index cards. It seems only common-sense that what is to be written on in ink should be of a better grade than what is to be writen on in pencil; but a great many office managers seem careless of this distinction.

Color can be made a valuable aid to time-saving, especially when there is a great amount of detail. Many concerns have found it helpful to use a blue or pink paper for memorandum forms or for other specialized uses. In choosing colors, it is important to select a color that is not hard on the eyes. The dark colors should in general be avoided—dark reds, dark blues, dark green, dark browns, and so on. The rule should be to use tints rather than colors. However, colors or tints shoould never be used simply for variety. It is better to stick to plain white unless the color scheme means something.

Finally, there is the matter of standardizing the use of stationery. Letterheads cost money these days, and every office should have strict rules against the waste or misuse of letterheads. To use valuable bond paper for interoffice correspondence, or for memorandum purposes, for example, is wasteful. The firm stationery should not be open to the free use of anyone in the organization, as is common in so many offices, but should be available only for business use and by the responsible representatives of the business. Much has been written about the losses suffered through office boys' thefts of postage stamps, but I venture to estimate that the losses through wasteful and personal use of the firm's stationary are far greater.

The remedy for office losses lies in the hands of the management. The wastes that exist are chargeable to the failure of the management in the average of fice to take the initiative, investigate the conditions that exist, visualize the improved conditions that are possible, and then take the necessary steps to bring about these con-



The "Y and E" Efficiency Desk

A time-saver for the busy man
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1 **Individually arranged** — Comes in six different models, each with a variety of possible combinations in drawer equipment. Each desk can be arranged to suit the user, so you can find what you want when you want it. Ask us to demonstrate.

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"Y and E"

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WHY COUNTERS FORM PART OF THE STORY

Readers of "Industry Illustrated" watch the records of industrial operations to measure progress at large, and with equal convenience may watch the records of *machine* operations to measure progress in their own shops.

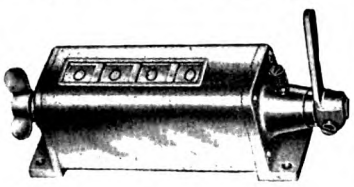
Veeder Counters register the sums total of production at the individual machines, just as the sum total of production developments is registered in this, your national Industrial Monthly.

Chiefly by indicating (and illustrating) the present *results* of industrial methods are the gains to be made—your paper is premised on this. Likewise, by indicating results of machine-operating methods—

Veeder COUNTERS

initiate gains in individual output, in efficiency of management and in consequent cutting of production cost.

The Set-Back Rotary Ratchet Counter below is for machines such as punch presses and metal-stamping machines, where a *reciprocating* movement indicates an operation.



Registers one for each throw of the lever, and sets back to zero from any figure by turning knob once round. Supplied with from four to ten figure-wheels, as required. Price with four figures, as illustrated, $11.50—subject to discount. (*Cut less than ½ size.*) Set-Back *Revolution* Counter of similar model, $10.00 (list).

The small Revolution Counter below registers one for a revolution of a shaft, recording a machine operation, or product. Though small, this counter is very durable; its mechanism will stand a very high rate of speed, making it especially suitable for light, fast-running machines, and most adaptable for experimental work. If run backward, the counter subtracts. Price $2.00. (*Cut 3/5 size.*) Small Rotary Ratchet Counter, to register reciprocating movements of small machines, also $2.00.



There's a Veeder exactly suitable for the type of machine you're interested in; write for free illustrated booklet.

The Veeder Mfg. Co.,
63 Sargeant St., Hartford, Conn.

ditions. Very often the office manager is not capable of making such a study. He is preoccupied with the details of getting out the work and supervising his employees, and has little time to give to matters of analysis, test, and standardization.

The root of the trouble lies in the attitude of the average industrial executive toward the office. He considers it as an unavoidable evil, necessary to the business but not profitable. He rarely thinks of it in the same terms with which he regards the manufacturing departments and the selling departments. As a result you find the widespread lack of knowledge of scientific methods in the office. Office managers rarely know how much work a clerk can do, or how much they do do. The test method is unfamiliar and rarely used.

Before we can eliminate the waste from our offices and get efficiency into our office work, we must conceive it on a scientific basis, get some standards of what is needed to be done and of what given workers can do. Then we shall be able to plan, and to measure results by the plan.

It all comes back, you see, to the method of test—of finding out what equipment can do, what workers can do, what a given method can do, what a given arrangement or plan can accomplish. Fortunately we are not entirely in the dark on these questions. Management engineers have been working for years applying the principles of scientific management to the office as others have applied them to the factory, and results are on record. The great difficulty lies in the traditional view of the office that I have mentioned above—the idea that the office is one of those necessary evils that must somehow be put up with. If business men only knew it, the difference between a profit and red ink on the ledger usually lies within their control, and often right in their own offices in the wastes that are daily occurring there. I have yet to see an office that cannot be improved in its working methods and output from 25 to 75 per cent by standardization based on careful analysis. And this statement is backed by actual measurements and records.

The Curse of Industry

The cause of unfair competition, the secret of failure, is blind adherence to the misleading formulas of Cost Accounting, and dependence upon their results.

Price Cutting is Profit Cutting

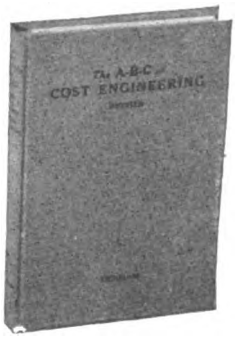
Few business men realize that *100% of a cut in price comes out of the profits. The cost is not changed in the least.* For example: If the normal profit on a $100 sale is $10, and the price is cut 5% ($5) the profit is cut 50%. If the price is cut 15% all of the profit is eliminated and five per cent profit on another $100 sale is given to the customer.

Leak Stopping is Profit Making

Every loss comes out of the net profits. The re entable leaks in the average business greatly exceed the profits. Every dollar of leakage stopped adds a dollar to the net profits. The greatest leakage is caused by the use of wrong cost figures as a basis of prices. *Correcting the cost figures reduces the leaks and increases the profits.*

Cost Engineering Stops the Leaks

Cost Engineering, (Denham Methods) not only reveals the leaks that sap the profits, but *affords a basis for prices* that will be fair to both buyer and seller, creating good will and confidence, and greatly increasing the profits of the business in which it is applied. *Denham Cost Engineering Service is Guaranteed.*



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The A-B-C of Cost Engineering, 116-pp. Cloth, will be sent without charge or obligation of any kind to General Managers or Corporation Officers of manufacturing concerns. (No attention will be paid to requests made by accountants or clerks.) *Send for it. A Cost Engineer Will Call If You Request It.*

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437 Sloan Building CLEVELAND

STATEMENT OF THE OWNERSHIP, MANAGEMENT, CIRCULATION, ETC., required by the Act of Congress of August 24, 1912, of INDUSTRY ILLUSTRATED, published monthly at Coopers-town, N. Y., for April, 1922.

State of New York, County of Otsego, ss.

Before me, a Notary Public in and for the State and county aforesaid, personally appeared J. R. Dunlap, Jr., who, having been duly sworn according to law, deposes and says that he is the Business Manager of the Industry Illustrated and that the following is, to the best of his knowledge and belief, a true statement of the ownership, management, etc., of the aforesaid publication for the date shown in the above caption, required by the Act of August 24, 1912, embodied in section 443, Postal Laws and Regulations, printed on the reverse of this form, to wit:

1. That the names and addresses of publisher, editor, managing editor, and business managers are: Publisher, The Engineering Magazine Co., 120 West 32nd St., New York City; Editor, John H. Van Deventer, 120 West 32nd St., New York City; Busniess Manager, J. R. Dunlap, Jr., 120 West 32nd St., New York City.

2. That the owners are: The Engineering Magazine Co., John R. Dunlap, J. R. Dunlap, Jr., J. H. VanDeventer, Rutledge Bermingham, and Walter Ives.

3. That the known bondholders, mortgagees, and other security holders owning or holding 1 per cent or more of total amount of bonds, mortgages, or other securities are: None.

4. That the two paragraphs next above, giving the names of the owners, stockholders, and security holders, if any, contain not only the list of stockholders and security holders as they appear upon the books of the company but also, in cases where the stockholder or security holder appears upon the books of the company as trustee or in any other fiduciary relation, the name of the person or corporation for whom such trustee is acting, is given; also that the said two paragraphs contain statements embracing affiant's full knowledge and belief as to the circumstances and conditions under which stockholders and security holders who do not appear upon the books of the company as trustees, hold stock and securities in a capacity other than that of a bonafide owner; and this affiant has no reason to believe that any other person, association, or corporation has any interest direct or indirect in the said stock, bonds, or other securities than as so stated by him.

J. R. DUNLAP, JR.,
Business Manager.

Sworn to and subscribed before me this 31st day of March, 1922.
(Seal.) CHAS. R. GOETZ.

(My commission expires March 30, 1924.)

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What Is Real Economy in Advertising?

(Continued from page 21)

At present, however, conditions are vastly different. Factories are not even approaching capacity production, and economic conditions present rough going with a slight upgrade, yet conditions are visibly improving. Maximum force is necessary. The peak of efficient sales effort is required. Such tactics would have been useless earlier in the depression in the face of conditions which could not be met by sales effort. Under such previous conditions, selling effort might be kept at normal until economic obstacles are removed, and consistent results are again possible by aggressive action.

On the whole, the appropriation of amounts which vary inversely with the momentum of products, will have a tendency to stabilize business at normal. In fact, a constant normal appropriation would permit the accumulation of a reserve during periods of low expense, with which to aid aggressive effort when the latter was required.

Now, what is normal? what is low? what is the peak? And at any point in this scale, what results may be expected from the expenditure authorized? These questions revert to the original proposition, and are determined by the tendencies in volume of business, resulting from various sales tactics and their cost.

The next principle has a very definite bearing on the economy of marketing, and is the defining of fields in which the product can be sold. Considerable data has already been compiled with reference to the distribution of consumer goods in the national market. For such commodities it may be the generalities in population, types, and various degrees of affluence, furnish sufficient data. But the niceties in refinement of market data, and the distinctions in results of sales tactics, are more clearly evident in a national market of selective character. Technical products or producer goods require this selection of prospects.

Selective selling may mean anything from "chimney chasing" to "calling by appointment." The basis of scientific selection, however, must refer directly to an analysis of the product. A mass market may be approximated from the uses of the product, on statistics obtained from a classified census, directory data, or trade association statistics, by approximating in these smaller groups the possibilities of its use. Refinement of the mass, however, should generally follow certain definite classifications which will aid in obtaining and applying a knowledge of conditions in each group.

Supervision of selling is most often planned by territory. Trade and business reports are usually made from each section of the country. It is natural, therefore, that geographical divisions should form the prime indexing of market analysis. A study of the product and its use will determine the secondary indexing. For a technical product this would obviously be by industries, grouping similar uses from an engineering viewpoint.

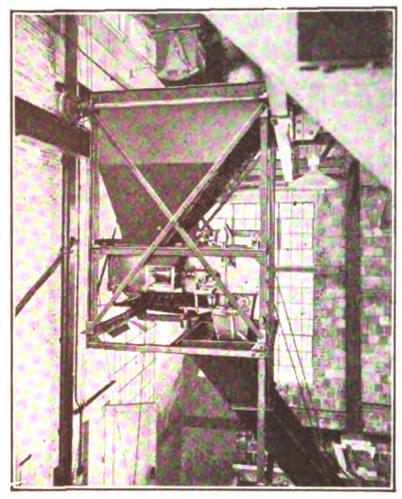
With a market divided both geographically and industrially, and an appraisal of prospects in each group, an excellent medium is thus provided for approximating sales possibilities at any time, as conditions vary. The sources of information on economic conditions applying to such classifications are too numerous to list. It is sufficient to mention trade association and trade paper reports, government departmental bulletins with particular emphasis on Secretary Hoover's new publication, "A Survey of Current Business." Bank reports, or bulletins such as published by the Alexander Hamilton Institute, Brookmire or Babson, will very often furnish the excellent detailed information.

Under the classifications outlined, opportunity is provided for systematic engineering analysis of the adaptation and use of the product in each industry, a study that will not only expand the market, but furnish very pertinent ideas for the copy writer.

Data is also obtainable as a guide in the choice of advertising media. The trade papers are anxious to tell just how thoroughly they cover their re-

Hidden Wastes between Coal Bunkers and Ash Pit

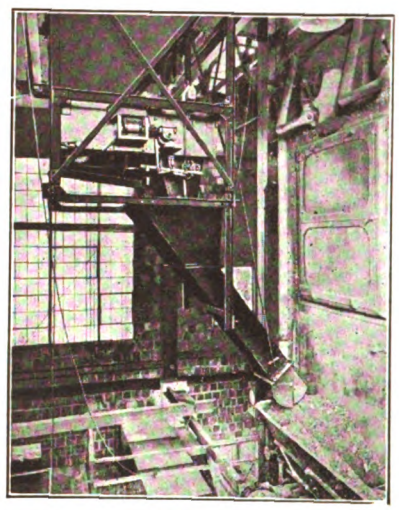
Soot, scale, holes in the fire box, faulty boiler linings, etc., all tend to lower the boiler efficiency. This results in incomplete combustion, and part of the potential energy, instead of being transformed into heat units, is lost up the stack or down the ash pit.



With 65% of your power costs figured in dollars and cents for coal, what would it mean to you to discover these faults before they have a chance to dig into your profits?

A RICHARDSON AUTOMATIC COAL SCALE

by registering continuously and accurately the exact amount of coal used day and night by every boiler, furnishes a dependable check on its consumption. If anything is wrong, the trouble can be detected and remedied at once.



RICHARDSON AUTOMATIC COAL SCALES can be conveniently installed beneath overhead bunkers for direct feeding to stokers. They serve as a continuous boiler test without costing a cent for labor.

Let us show you what we have done for others in cutting down power costs and eliminating unnecessary waste of coal.

Bulletin No. 2059-A will give you a new angle on The Coal Problem.

RICHARDSON SCALE COMPANY
Passaic, NEW JERSEY

New York Boston Buffalo Chicago Minneapolis Omaha Wichita San Francisco Memphis Atlanta

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LEWIS-SHEPARD MEANS LABOR SAVING



$12,140.00 reduction in annual overhead costs from an initial investment of $1,798.00

—is the exact total saving a recent investigation showed that the Lewis-Shepard System of interior transportation (of which the JACKLIFT Elevating Truck is the basic key) is making *every year* for four New England manufacturers;—a saving that is being felt, in proportion, by every one of more than 3,500 JACKLIFT users throughout the country.

Don't these figures interest YOU?

The JACKLIFT is but one of a complete and efficient "family" of Lewis-Shepard products for speeding up and economizing the handling of goods, and mobilizing floor space.

You have a handling problem, no matter what your business is. It may be a problem of horizontal handling. It may be a problem of *vertical* handling. It may be both. But with one or more members of this Lewis-Shepard "family" you can solve it completely, and turn much of what is now "overhead" into *profit*.

Will you let one of our engineers show you exactly how? No obligation. Write us.

LEWIS-SHEPARD COMPANY

568 E. First St., Boston (27) Mass.

Representation in Principal Cities

Manufactured and sold in England and Canada



Our Barrel and Case Truck



No necessity for extra "helpers" if this truck is used. One man can easily and safely move any of your barrels or cases. With it, shipping clerks often do both the checking and moving alone. *Write for full particulars.*

spective industries, but these papers are of value in advertising a product, only in proportion to the actual prospects for that particular product in their field. The data will determine the advisability of using media of broader circulation such as business papers or class papers. It will definitely show the wisdom and economy in further refinement into mailing lists for Direct Advertising.

Aside from personal selling the closest touch to any market is through direct advertising. And with a Master List of prospects, segregated by location and industry, copy may be written so pertinent to group conditions, as to seem almost personal. Here, certainly, is the peak of attention value from prospects.

It is interesting to note that in "covering" a moderately selective market the properly guided salesman will call only on probable prospects, except for some definite missionary work. Direct mail will reach a list of possible buyers. So the field widens through trade papers, business papers, class papers, newspapers and general magazines. The attention value is diluted and the expense per unit of return is generally higher as the media broadens.

A diagram of this condition consists of an inverted triangle, the point of which constitutes the nucleus of the market. The diverging sides at various sections include the additional waste of broader circulation.

Another interesting feature, with market data refined from general information and a definite listing of individual prospects, it is frequently possible to check one against the other for market tendencies and in a general way for statistics. The extraordinary value of a Master List of prospects to the Sales Department, will enlist their heartiest effort in building and maintaining it.

The technique of advertisements is fairly well devoloped, and has been ably presented by various authorities. Here, of course, there is possibility of wide variation in pulling power, and a wide choice in expense of layout, typography, make-up, and the art work, for this is essentially the art field of advertising. Yet even here control of fancy must be maintained by science. Tendencies are discovered in practice which lend themselves to approximating expense and results with remarkable accuracy. To treat this phase of the subject would require a volume on the development of advertising technique, and there is no need to revamp in a picayune way the work of masters.

But the assembling of those factors which aid in approximating results to be obtained from a definite appropriation, is interesting, and perhaps in a sense pioneering. With a market having a certain known measure of prospects allocated both geographically and industrially, with a knowledge of current conditions in each locality or industry, and a broader view of general business conditions, with a basis of past efforts and results from which to judge, it is possible to make definite plans for future work and estimate cost and profit. The results must be gauged largely from the data outlined above, the appropriation may be based on carefully figured tentative plans, the cost should be controlled by a very definite plan of appropriation distribution, outlined, of course, to fit the particular case, but recognizing standard factors. These factors are cost units analogous to production centers in a manufacturing cost plan.

A classification of expense is first constructed to include all items. The media are listed by type, covering the complete usage of a campaign or a year's efforts. A tentative plan outlining the advertising tactics of the year is built showing each piece of work and its destination in the market. The expenses for each phase of the plan are thus constructed.

Results may be approximated by the knowledge of market conditions obtained from the Research data, but must be measured on a comprehensive scale. Not only direct returns, but educating the market to the product, reducing sales resistance, and, therefore, sales effort, and helping to create an attitude toward further favorable consideration, should be accounted as results.

If the man with the money can be shown a definite market, and a logical plan for going after it, he will be willing to finance it.

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The Making of a Telephone Girl

(*Continued from Page 26*)

courtesy are heightened when she goes to any one of the three employment offices of the company—perhaps the office at Broadway and Twenty-seventh Street. There she enters a pleasant room, artistic with the soft grays of its woodwork, which are brightened by the pretty colored chintz and wicker seats and writing desks. She is met by a smiling, courteous young woman, who, after the applicant has filled out an application blank, conducts her into an adjoining office and personally introduces her to one of the interviewers. The interviewers are pleasant, attractive young women, all of whom have been operators, themselves, and have been chosen from the ranks for this work, on account of their discernment and tact. The interviewer attempts to draw the applicant out, to make her feel at ease and to talk naturally. She makes every endeavor to establish a feeling of mutual friendliness, and to give sufficient time and attention to each applicant so that if one is not accepted, still she will go away with a friendly feeling that she has been given a fair chance. This is a tremendous task for the interviewers, for in 1921 the company received over forty thousand applicants, from among whom considerably less than one-third were accepted. In the selection of operators, many factors must be taken into consideration, two of the most important, of course, being hearing and enunciation. A common school education is required.

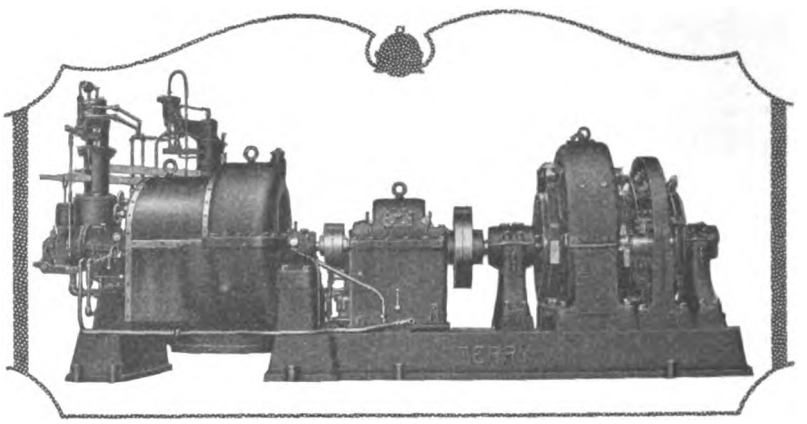
After passing the employment department, the applicant is given a medical examination by a woman doctor in the employ of the company. If she receives a clean bill of health, she is ready, without further preliminaries, to enter the training course.

From the moment a girl enters the training course, she is an employe of the company, graded as a student, and receives a salary. For one month she is trained in the principles of the company and in the fundamentals of telephone operation. The New York Telephone Company is a service organization; therefore, its employes must be imbued with a sense of service. In order properly to carry out the company's ideas of service, the operator must have courtesy, accuracy, and speed. These three requisites the teachers in the training school strive to develop in the students.

The organization of the training school is in keeping with the splendid organization policies which govern operations throughout the whole company. Under a charming and most delightfully "human" manager of training schools, a corps of instructors gives individual training to each student. As in all of the other departments of the company, the instructors in the training schools are chosen from the ranks. They have been over all the ground in the work of the Telephone Company which the student must cover, so they know all the pitfalls, and they have been selected because of their knowledge of the business and their ability at presentation. Each one who has been chosen to become an instructor makes a special study in preparation for the work, then for one month—that is, through one course of lessons—she observes the class work under an experienced instructor. The second month, under supervision she conducts a class through the course. After that training, she undertakes the class work alone, with occasional suggestions and supervision from the head of the training school or one of her assistants.

The course of training consists of twenty lessons, with review each Saturday. In the eight hours each day which the student devotes to the training, she is given class room work in theory and in a review of the lesson of the previous day. Then she has about three hours of practice at a "dummy" switch board, where she works out by actual operation whatever new phase she has learned that day in the class. In the class room work she learns how to receive the subscriber's call, how to pass it on from the "A" board to the "B" operator, how to handle emergency calls, such as calls in case of fire, or for the police

(*Continued on Page 55*)



Where Steam is Going to Waste•

IN many plants steam exhausted from non-condensing steam operated on steam heated machinery is blown to the roof. Don't do it. It is possible to obtain just as much power from this steam when expanded to a 29" vacuum as can be obtained from steam at 150# pressure expanded to the atmosphere.

Terry low pressure turbines are today giving users 85% added power without increasing the steam consumption. Of course, there are many plants in which the supply of exhaust is too fluctuating to make a straight low pressure turbine practical. But the Terry Mixed Pressure Turbine will take care of any such fluctuations, and at the same time maintain constant or variable power load. This feat is accomplished by a controlling mechanism which allows the turbine to operate on low pressure steam just as long as there is any available. When the supply falls off, enough high pressure steam is automatically admitted to a high pressure element to maintain the desired power load. If the low pressure steam supply fails entirely the turbine will automatically operate as a high pressure turbine.

The economic conditions which favor the application of low or mixed pressure turbines are explained in Bulletin Z-25. Write for it and find out if you can save a lot of money if you

Specify

T-772

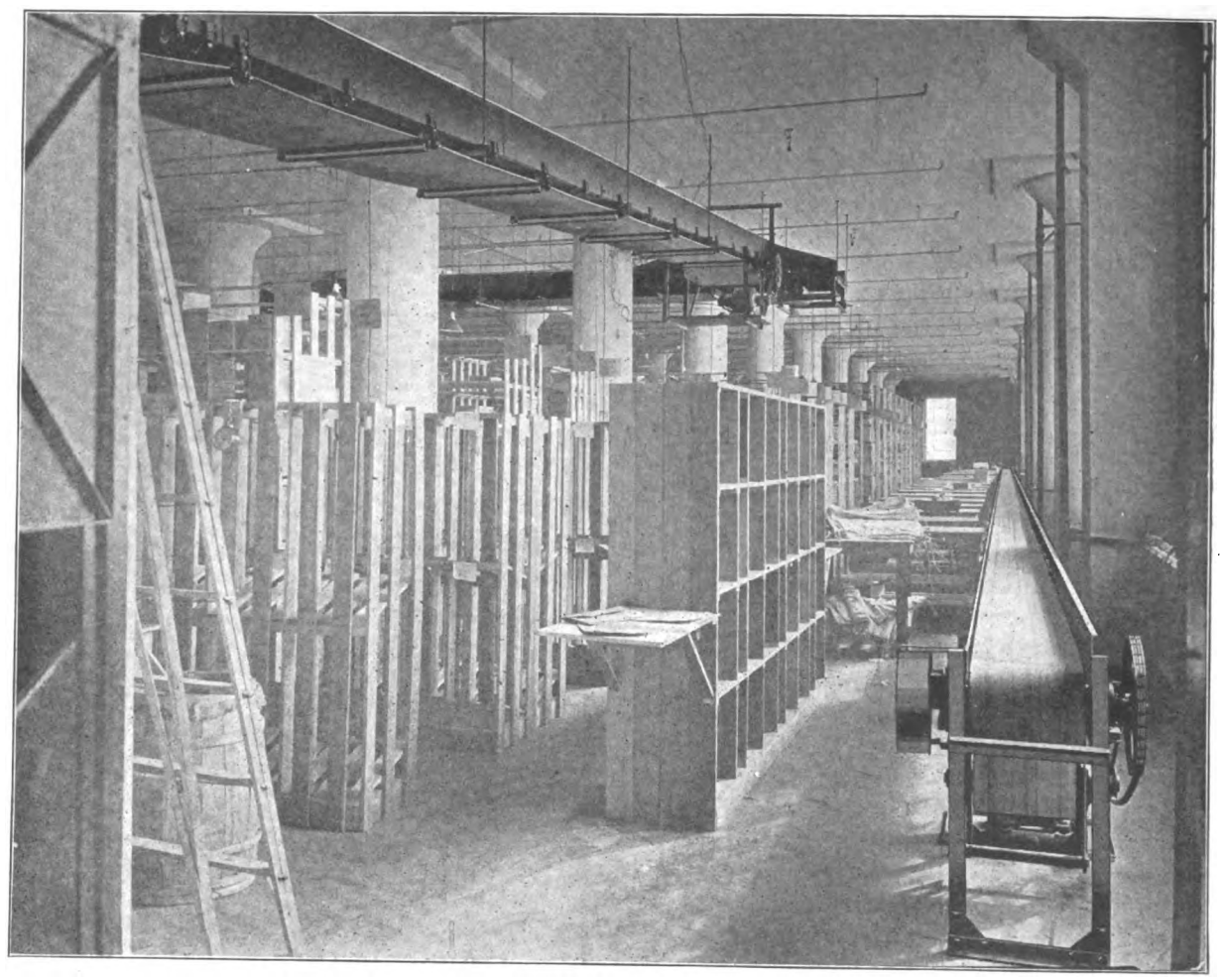
THE TERRY TURBINE



Offices in Principal Cities in U.S.A. also in Important Industrial Foreign Countries

The Terry Steam Turbine Co. Terry Sq. Hartford, Conn. U.S.A.

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Showing the manner in which belt conveyors can be installed. Note the conveyors hung from ceiling as well as conveyor to the right placed on floor.

Why Did The Diamond Match Company Equip Their Plants with Conveying Systems?

Because they realized that efficient handling of the raw materials entering into their finished product through the various operation stages meant increased production.

Production of a product has its inception the moment raw materials are received and is not completed until the finished product is in shipping room.

Raw materials, products in various stages of completion and the finished product should be handled mechanically in order that production be increased.

A conveying system to be efficient must be designed to conform with individual requirements. Your method of manufacture must be studied carefully in order that the proper system can be developed.

We will gladly have one of our conveyor engineers call and make a survey of your handling problems. Write us at once. This service does not obligate you in any manner.

SAMUEL OLSON & COMPANY

2428 Bloomingdale Ave.
CHICAGO, ILL.

200 5th Ave.
NEW YORK, N. Y.

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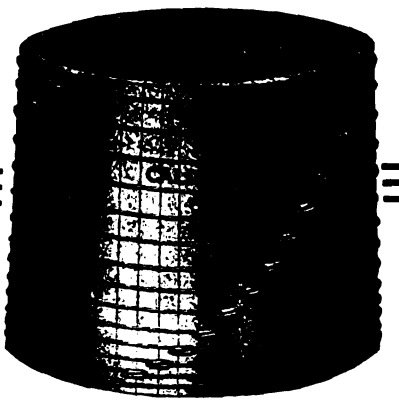
(*Continued from Page 53*)

or for an ambulance or doctor. She is particularly trained in enunciation, in voice modulation and intonation, and in the phraseology of the telephone operator. By easy transitions she is carried through each detail of the work which she must undertake at the real board, so that at the end of the training period she thoroughly understands the fundamentals of telephone operating and is able to meet the ordinary conditions arising in the work. In all of this training, courtesy is especially stressed by the instructor both by precept and by example. The classes are comparatively small, consisting of from twenty to twenty-five pupils, so that the instructor can give individual attention and can draw out the pupil and help her to figure out for herself each procedure. The response which the instructors receive is remarkable, for the girls are alert and eager, and quickly grasp the salient points of the lessons.

The very first day that the student attends the training school, she is given her own operating set, taught how to adjust and use it, and takes her place at the practice switch board. The work at this board is conducted in the same way as that in the central offices. In fact, to an outsider there seems to be very little difference in the appearance of the training room and of the central operating room, except that in the school the board is smaller than in the central offices, and a supervisor superintends the work of three students, whereas in the central operating rooms one supervisor attends about nine operators. But in the work at the board, from the first the student proceeds as though she were actually handling subscribers' calls. Of course, in the training school, a "dummy" switch board is used. The calls originate with supervisors who act as the calling subscribers and also receive the calls when they are put through to completion. The student works at an "A" board, that is, directly receives the subscribers' calls. In order not to impede the work, experienced operators handle the "B" board. In the school, the work runs around in a circle. A supervisor, representing a subscriber, calls a number—say, on the Riverside exchange. This call is received by the student at the "A" board. She presses the "Riverside" circuit button which is one of the group of buttons at her left hand, and passes the number to the operator who has charge of the part of the "B" board supposed to represent the Riverside Central office. The operator at the "B" board plugs in to the number called, and the circle is completed by the supervisor, acting as the answering subscriber. Other supervisors—one to three students—superintend the work at the boards In this way, each student is again given individual attention, her good points are noted, and her shortcomings corrected.

Too much cannot be said in praise of the work done by the instructors and supervisors in the training schools. They have patience, kindness and courtesy, and a friendly human interest in the girls under their charge. The interest that they take in the girls does not stop merely with training them to become operators. They are truly "big sisters" to these young girls who are entering the business world for the first time, and they find that their friendliness is met in the spirit in which it is given. By courtesy, tact, and a kind personal interest, as well as by a thorough drill in each step that must be taken, the instructors lead the students through the maze of theory and practice through which they must go in order to become operators, and start them on their business course. By the time the girl is ready to be ranked as a junior operator, she not only has learned the rudiments of telephone operating, but she has acquired some appreciation of the idea of service which the company sets as a standard for its employes, and a realization of the responsibility which every operator must feel in regard to her work.

Her training does not stop when she passes from the training school into the central office operating room. In fact, it may be said that the training of an operator never does cease. After training, the first step is the position of junior operator. Upon enter-



Prominent in High Places

The excellence and sturdiness of character that ensure prominence in high places are found in Caldwell Cypress Tanks.

Selected cypress from our own trees and sawmills, carefully dressed and fitted by our own workmen skilled in thirty years of building "The Tank with a Reputation," is a combination that affords the utmost of water-tightness and weather-resistance.

Send for Catalog

W. E. Caldwell Co.
Incorporated
200 Brook St. Louisville, Ky.

Caldwell TANKS AND TOWERS

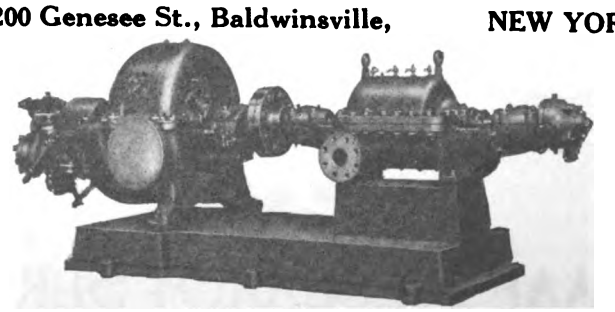
MORRiS PUMPS

Require Minimum Attention

One of the reasons for the choice of Morris Centrifugal Pumps is their absolute reliability under all conditions. They require very little care and are built for the 24 hour service. The end thrust in the horizontally split multi-stage pump shown below is taken care of by a water-cooled marine type bearing running in oil. Suction and discharge openings are located in the bottom half of the shell, making it unnecessary to disconnect the pipe line when dismantling the pump.
Build in capacities from 100 to 6000 gallons per minute.

Our consulting service and descriptive literature is yours for the asking. Write for bulletins.

MORRIS MACHINE WORKS
200 Genesee St., Baldwinsville, NEW YORK



Centrifugal Turbine Driven Boiler Feed Pump

Since the Civil War Builders of Hydraulic Dredges, Centrifugal Pumps, Steam Engines.

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TABER PUMPS

For the Unusual Pumping Problems

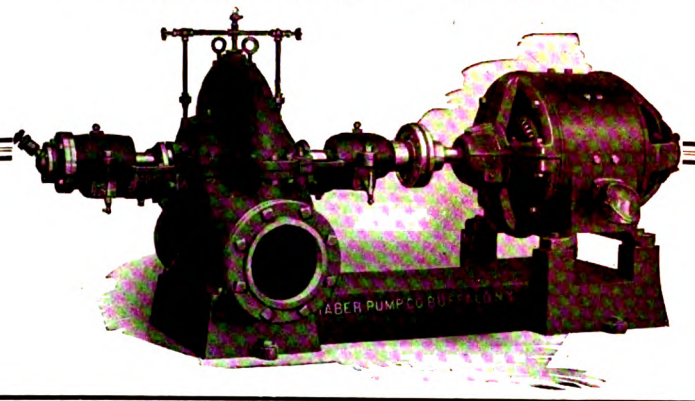
Our Rotary Pumps are efficiently meeting the excessive pumping demands of viscous materials such as heavy oils, tar, asphalt, molasses, etc.

Our Centrifugal Pumps are used for handling water or equivalent liquids. All iron or bronze fitted.

TABER PUMPS are noted for the care and accuracy with which the interior parts are designed, machined and assembled and for their freedom from breakdowns.

We solicit your inquiries and specifications

TABER PUMP CO., BUFFALO, N. Y.



A Dog Is Entitled to One Bite ~

One bite is required to brand a dog vicious—but only one. His owner pays the penalty for a second bite—and deservedly.

One failure in any particular endeavor is excusable—but only one. Former experience should be sought and considered before new attempts are made.

If you have a problem of a technical kind—a civil, a mechanical, a chemical or an electrical engineering problem—get *all* the facts—learn what others have done and are doing.

The Schaaf Research Service collects all pertinent data—facts, figures and forecasts, and further informs you of current developments for as long a period as desired.

Send for complete details, giving us some information as to your requirements.

TYPICAL REPORTS

Industrial Lighting—Proper Illumination of factories, shops, draughting rooms, etc., $30.00.

Graphic Methods in Industry—Application of graphs, charts, etc., to all phases of an industry—production, operation, costs, sales, etc., $55.00.

Water-proofing and Acid-proofing of Concrete—Tanks, reservoirs, conduits, pipe lines, etc. Methods of applying, existing installations, etc., $20.00.

Drying Processes—All types of ovens and equipment for drying and dessicating; dehydration of foods; spray drying, $30.00.

Send for complete list.

SCHAAF RESEARCH SERVICE

15 East 40th Street New York, N. Y.

ing the central office operating room, the student is given a short time to adjust herself and to become accustomed to the new atmosphere, so that whatever nervousness she may feel will wear off. When she begins actual work at the board, a supervisor "listens in" with her in order that she may gain confidence, and also in order that the subscribers will not be delayed by an inexperienced operator. Thus gradually and easily the girl grows into the work.

Her development from that point is in proportion to her own ability. The idea seems to be fairly prevalent in the minds of the general public that "once an operator, always an operator," so far as any opportunity for advancement and greater remuneration exists in the company. This is not the case. The work of each girl is carefully observed. If an operator displays speed and ability, or special aptitude for certain lines of work, she is given every opportunity possible for advancement. This is not only for the good of the girl but for the improvement of the service in an organization where many openings occur for those who can qualify. Advancement in the company is based upon two counts, efficiency, and length of service. Length of service is secondary to efficiency. Above the position of senior operator are those of supervisors, assistant chief operators, and chief operators. There are also the positions of special operators, "information," instructors in the training schools, and other special positions for which the girls can strive to qualify. Each one of these positions demands certain qualifications; if a girl is believed to possess these qualifications, she is given a chance, and the heads of departments are constantly on the outlook for good material for these various positions. In fact, they take keen delight in making discoveries about the abilities of the girls, as in the case of one manager who was attempting to find someone who could give public demonstrations of the work. She found a supervisor who had a good personal appearance and a pleasant voice, but, who, the manager feared, might not have the magnetism nor the imagination to put the facts over convincingly to an audience. However, the girl was given a trial, with the suggestion that she forget that she was a supervisor and try to imagine herself an operator going through each part of the work. The girl threw herself into the new work with such imagination and enthusiasm that she made a very great success.

It has already been said that the instructors in the training schools have been through all the work that the student must learn; they have been chosen on account of special qualifications and have studied to fit themselves to teach. The interviewers in the employment department also have at some time been operators, and were picked from the ranks because of their fitness for that particular work. So in all of the positions in the company, each is attained by continuous training and a series of promotions.

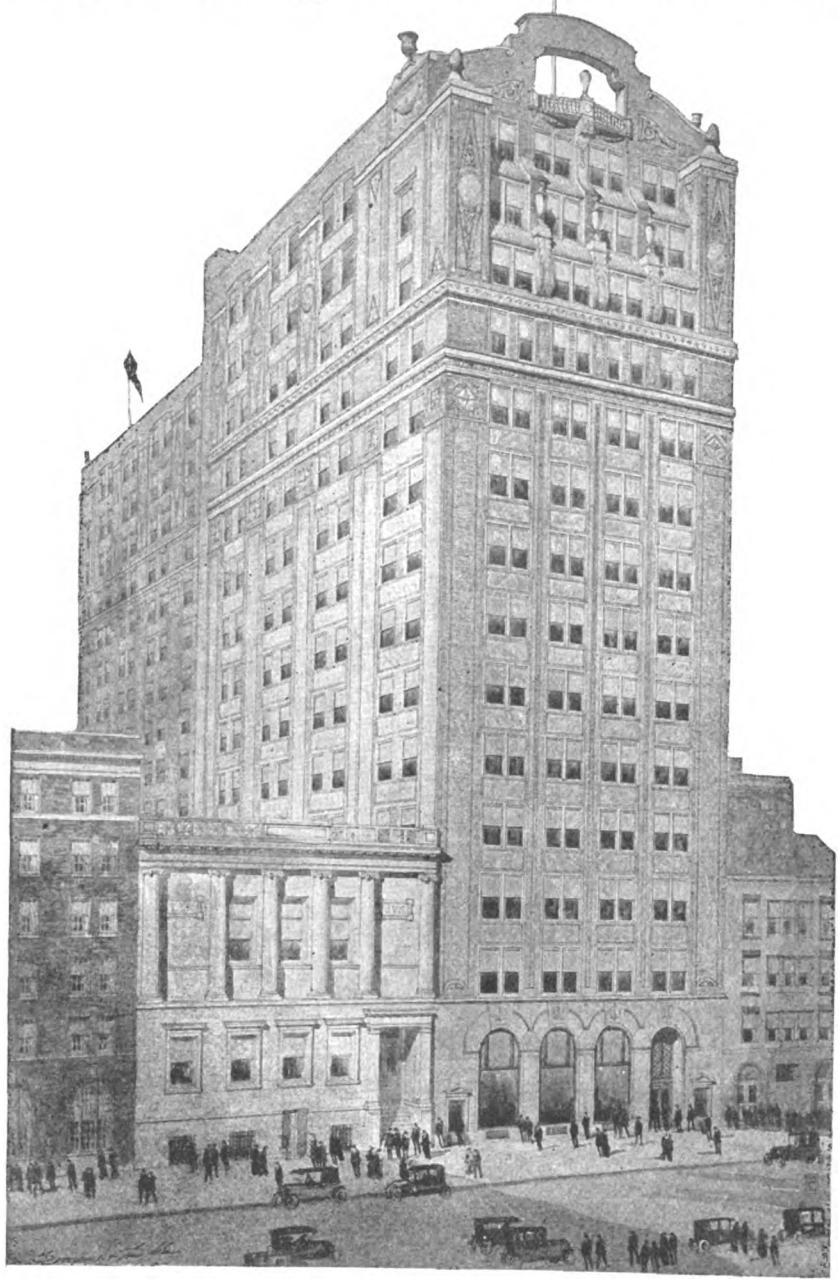
This "big family" spirit has permeated the organization, so that everyone in it feels that she is a part of the company, that it is "her" company, not just "the" company. Right through her training the operator is encouraged to use her imagination, to realize how important a part she is not only in the company but in big business. The romance of her work is brought out, the idea of the adventure that lies back of each call emphasized. Any call may mean a big business deal; or the operator may be an important instrument in averting an accident or a great disaster. So firmly imbedded in the consciousness and conscience of each operator is the sense of responsibility for her job and the necessity for good service that it is inconceivable that she would leave her position at the board in time of emergency. An operator would no more leave the board when there was a blaze of lights there than a fireman would run away from a fire. On the contrary, she would stay at her post and coolly, quietly, without confusion, answer each call with that cheerful interrogatory "Number, please?", put in plugs, pull them out again, connecting and disconnecting, until relief came or the emergency was past.

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BAR BUILDING

An Office Building for Lawyers

36 W. 43rd St., Through to 37 W. 44th St., New York



Charles L. Fraser
Building Contractor
372 Lexington Ave., N.Y.

Knickerbocker Fireproofing Company.
Floor Arches
and Concrete Works
56 West 45th Street, N.Y.

S. H. Sweeney
Heating & Ventilating
Contractor
213-215 E. 44th St., N.Y.

Fish Brick Sales Co.
Face Brick Contractors
25 W. 45th Street, N.Y.

Campbell Metal Window Co.
Metal Windows
8 West 40th Street,
New York

Gurney Elevator Co.
Elevator Contractors
300 Eighth Ave., N. Y.

South Amboy Terra Cotta Co.
Terra Cotta
Contractors
150 Nassau Street, N.Y.

Hay Foundry and Iron Works
Structural Steel
15 Madison Sq., N. Y.

Farnum Plumbing Company
Plumbing Contractors
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372 Lexington Ave.,
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Severance & Van Allen ---- ***Architects***
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STORES and three lower floors will be open to commercial tenants. Directly connected with the House of the Bar Association which has over 2600 members. This is the first Professional Building for attorneys in New York. Space is being rapidly absorbed by prominent men of the Profession. This building will be an asset to your business. The large store and mezzanine has frontages both on 43d and 44th Streets and display along the entire course of the Arcade which connects the two Streets.

For further Information Address Burton Thompson, Managing Director

BAR BUILDING INC.,

372 Lexington Avenue, New York City

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Westinghouse Motors on the last lap of their journey on Mathews Gravity Conveyors through the various assembly departments of the big East Pittsburgh plant

Gravity Helps to Produce Power

in one of the largest plants of the country devoted to the manufacture of Electrical Products

The Westinghouse Electric and Manufacturing Co., (East Pittsburgh) learned the value of mechanical handling during the war. They have introduced efficiency, speed and economy by installing gravity and power conveyers to link up the various assembly, packing and shipping departments. Mathews Conveyers served well in war emergencies and are now retained as important units of plant equipment.



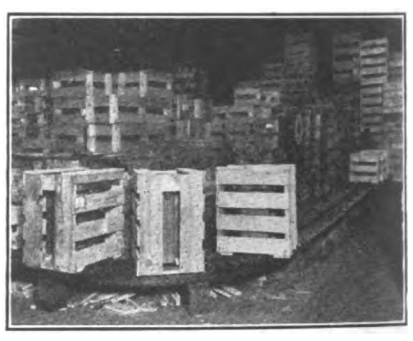
Packed motors on Mathews Roller Conveyers making the "loop" through the weighing, stenciling and addressing room.

Nationally Known Products are handled on Nationally Known Mathews Conveyers

Mathews Conveyers

are adaptable to most any industrial handling requirements.

Consecutive order of operations, increased production, lower handling costs and reduced storage and trucking space are some of the advantages of employing free gravity and Mathews Conveyers for lugging and handling materials and packages.



Packing and Crating Dept. for heavy transformers. Here again, Mathews Conveyers keep the packages moving in a steady stream.

Mathews Conveyers

will reach into every nook and cranny of the largest factory and minimize that great general loss due to wasteful handling methods, a loss that too frequently remains unseen unless pointed out.

We maintain Engineering Service Branches in all principal cities, in charge of competent consulting and designing engineers.

Send for general catalog.

Mathews Gravity Carrier Company

157 Tenth St., Ellwood City, Pa.

Branch Factories: PORT HOPE, ONT. LONDON, ENG.



Showing one of the several Mathews Roller feed lines to Mathews Power Conveyer in Department where miscellaneous Westinghouse Products are boxed for shipment.

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